

- Sciences (Paper presented at the OECD Workshop on Social Sciences and Innovation). Tokyo: United Nations University.
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Group Events Raised by Network Public Opinion Based on CA

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Abstract

With the popularization of Internet application, group events caused by the network public opinion have occurred from time to time which caused irreversible loss and damage to the society and people. Group events prior monitoring, far more than make up for the importance of post. By using the method of cellular automata on line monitoring of group events, public opinion found initial stage transfer will exhibit the occurrence of clue of group events. Hope that through public opinion transmission "media network" transfer "Half-Life" and users "psychological convergence" of public opinion information intervention, to realize online monitoring to public opinion group events.

Key words: NETWORK PUBLIC OPINION, GROUP EVENTS, ONLINE MONITORING, CELLULAR AUTOMATA

1. Introduction

Public safety is the base of national and social stability, and the outbreak of group events has great destructive power to people's lives and property. Therefore, it is necessary to monitor the outbreak of group events and do the early-warning and intervention before the group events take shape. The fundamental of this action comes from the research and discovery to the trigger group events.

With the popularity of the Internet, the network information packed into every corner of our lives. More and more people are willing to express personal ideas through networks and brought a lot of group events because of the network's covert, divergent, permeability and arbitrary properties. For example, the public opinion circulated on the Internet after the 2008 Wenchuan earthquake Zi ping reservoir contamination which aroused the crazy water. In 2007, "the poisonous bananas in Hainan" opinion on the Internet brought a huge social and economic loss to countries and peoples. In 2011, Japan "radiation leak" caused "strong salts". Therefore, group events are raised several cases show that public opinion is an irreversible trend.

We use the method of cellular automata to find key factors influencing group events which are raised by the public opinion in order to achieve online monitoring of group events.

2. Online simulation and verification of group events triggered by public opinion

The Internet has become an amplifier of public opinion. Many group events are raised from the Internet in today's society. Smelting has used the game theory to explain the development of group events. He regards the emergence of group events as the six factors, which are structural incentive factors, deprivation caused by the social structure, bitterness, the control down of effective social mobilization social, factor or event that triggers social movements and the effective social mobilization [1].

2.1 Enlarge of Actual Events through Network

Internet users are holders of various emotions, attitudes and opinions, using online media properties and powerful service to express public opinion. They are the important guide and influence power of public opinion. With this power, the public opinion may lead to group events, or promote the malignant development of group events indirectly [2].

Network has a clear amplification function. When an individual stays alone, he has to need to control their words and deeds. On the Web, the individual intermingled with the group, and got the idea that "group is an anonymous, and the members do not have to take responsibilities" [3]. The refraction and magnification of the real case through network lead to the acceleration of the actual events' outbreak.

2.2 The Network "Same Way" Response

The certain "social psychological expectation" is the reason that public opinion can be formed, and group events can be raised. The so-called "social psychological expectation" is the response to a high degree of attention and anxiety. Due to which this kind of problem is difficult to solve, and psychological stress during a certain period cannot be alleviated, the network users are expecting an object as a vent in the subjective stress and pressure export. At this time, various events and people associated with such issues came into the "social psychological expectation" range. From this perspective, the mentioned event "focus" almost just was one or more points to the "social psychology" [4].

SIR model has regards the probability of getting the rumor information as the same for each one. But the reality of rumor transfer is different. It has the cumulative effect on both other individuals and the rumor transfer history [5].

2.3 Spreading Tension

Not all real events can lead to public opinion, and even group events. First of all, there should be a "nerve" event and the attitude and will of the reality beyond the expression. The dissemination of informa-

tion is a nonlinear process. But the receiver of the public opinion is not only a simple passive acceptance, but also a shape process of public opinion information. The more information of public opinion disseminated, the more authenticity missed. The spreading tension comes from the society as a whole, developments in the network, and counterproductive to reality [3].

Meanwhile, the network groups can spread the psychological tendency to the susceptible individuals. The social responsibilities disappeared when the network users faced with a heterogeneous group. Within this group of homogeneous, it's very easy to cause group polarization of public opinion. In the network environment which lack of communication, it is easy to get some kind of imagined sense of group identity. With the cognitive bias of "mirror consciousness", people tend to exaggerate the power of a group, and achieve self-confidence with more active dissemination of extremist views [4].

2.4 Group Detonated

In the process of group events activation, we can see the "butterfly effect". The public opinion forms instantly and interacts at the real-time. Through the intricate communication network, the information spreads at random [3]. The scholars have used the Mean-field methods and the Toscani model to discuss the initiation of group events. But the hypothesis is that all the individuals are fully mixed. It contradicts to the fact when the individual is not a global information receiver or when the receiving of information has something with the site of receivers.

In addition, the public opinion formed with the continued reality attention. The process from the "forms" to "explosion" needs to go through the accumulation of varying duration. This "accumulation" showed continued interest and thoughts on the event. First of all, netizens' mood states in a critical state and changes from the "micro-climate" grow into "climate" with the stimulation of real events. Then, netizens emotional experiences the fission process, and frequently participants led to the reaction on reality which aroused the group events at last [2].

3. The online simulation and verification of Internet public opinion leads to group events

The public opinion spreads in the virtual space of the Internet. The entire process happened in a complex system [7]. Therefore, many scholars use the complex systematic research methods to study the spread of public opinion. Cellular automata is a grid dynamics model with the characteristics of spatial time, space, state which explores the local and global interaction in the most simple of complex system mo-

dels, it is the basic calculation model for the analysis of complex system evolution [8]. Scholars have achieved a lot in the research area of public opinion using the model.

Fang Wei (2012) presents a cellular automata model with an extended collaboration. She expresses the main herd mentality with environmental adaptation achieve a bias of public opinion transfer with preferences parameters. Jianhua (2012) puts forward the cellular automata models in Fuzzy rule, which perspectives in the process of anti-seismic network public opinion formation process, as well as the group polarization phenomenon [10].

Scholars using cellular automata for public opinion research concerned more about the spread of public opinion itself or public feeling rather than the group events. Therefore, we examine the online simulation of network public opinion group event based on the study results of numerous scholars with the tools of cellular automata.

3.1 Model

Cellular automata are defined in a discrete cell composed of cellular space, and according to some local rules, in the time dimension of dynamics of discrete system. The basic components are cellular, the cellular space, neighbors and evolution of rule.

3.1.1 Cellular Automata

Cellular is the basic unit part of CA. Cellular distributes on the discrete of one-dimensional, two-dimensional or multidimensional space lattice points. In the most basic model of CA, cell gets the discrete-State which evaluates as (0, 1) or (-1, 0, 1). In this model, the cell on behalf of the individuals involved in the transfer and exchange of public opinion. In the process of public opinion transfer, individuals' state of public opinion is not entirely clear of neutrality, in favor or against. So we set the state of the cellular automata individuals as random values. Cells' state changes over time.

3.1.2 Neighbors

Neighbors are such kind of cells who have an impact on other cellular automates. Each cell has its own neighborhoods, which influence their own cells. in Two-dimensional cellular automata space. They fix the number of neighbors with the radius of r . According to the number of affected neighbors, we defined neighborhood field as four neighbor areas, eight neighbor areas and extended areas. We select eight neighbors area as the specific neighborhood.

3.1.3 Cellular Space

Cellular space is the space distribution of the dot collection. Dot collection can take many forms, such as one-dimensional and two-dimensional. Cellular

automata can also be arranged as the shape of triangular, rectangular or hexagonal grid. Boundary conditions can also be divided into periodic type, reflex type or fixed value type.

During the public opinion process, cellular individuals are influenced by under the cellular around them [8]. This cell arranged in a square grid and the cellular space is 100*100. We select a field of eight neighbors as the influence state. That is, a cell just exchanges information with the eight surrounding neighbor cells. And the affected neighbor can be set as follows:

$$S_{ij}(t+1) = W_{ij} * S_{ij}(t) + (1 - W_{ij}) * (S_{i-1,j-1} + S_{i-1,j} + S_{i-1,j+1} + S_{i,j-1} + S_{i,j} + S_{i,j+1} + S_{i+1,j-1} + S_{i+1,j} + S_{i+1,j+1}) \quad (2)$$

3.1.4 Evolution Rules

Each time step, the attitude of all the cellular individual view state will change under the influence of tension because of the transformation affected by the eight surrounding neighbor cells. Set the time step as T=120, and all the cellular traversal at each time step.

3.2 Simulation and Analysis Step

3.2.1 Simulation Step

We simulate the evolution of public opinion with Matlab. The steps are as follows:

1. Create Public Opinion individual cellular space 100 * 100.
2. The state of public opinion assignment each cell, so that the state of public opinion, while the definition: If the yuan against the state if cell cellular neutral state if the state is in favor. Give each cell a certain value with the rand function, so the initial value of the individuals is $s_{ij} \in [-1, 1]$. $s_{ij} \in [-1, -0.5]$ is the value of the cellular which got the opposite view.

$$\begin{pmatrix} S_{i-1,j-1}^t S_{i-1,j}^t S_{i-1,j+1}^t \\ S_{i,j-1}^t S_{i,j}^t S_{i,j+1}^t \\ S_{i+1,j-1}^t S_{i+1,j}^t S_{i+1,j+1}^t \end{pmatrix} \quad (1)$$

In addition, due to the "spread tension", the individuals will be affected by their own knowledge background, social status and different individuals' experience. We set the value of "spreading tension" as $W_{ij} \in [0, 1]$ which cannot change with time. In the role of spread tension, cellular state value changed according to the following formula:

3. Assign a spread tension value to each cellular: $W_{ij} \in [0, 1]$
4. Set the running time to T=120, loop through all the cells to transform the cellular status value.

3.2.2 Analysis of Simulation Results

In fig.1, we can see that the ratio of the cellular changes a lot in the different state of public opinion. The numbers of the cellular which opposite or support the views are all reduced and the number of the cellular holding a neutral view increased. In this case, the end of the public opinion comes quickly, and the group event will also disappear

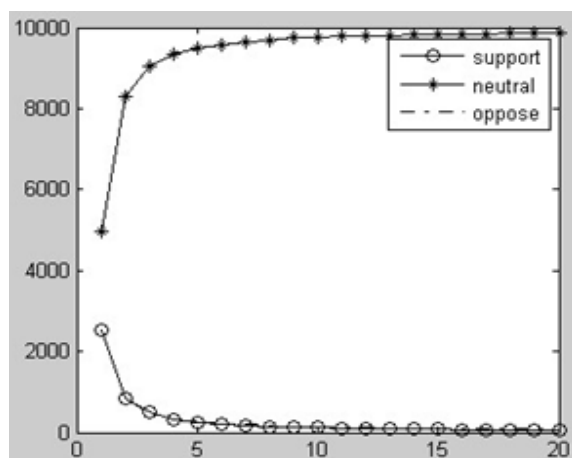


Figure 1. The ratio change of the cell number in different state (partial data)

During the simulation process, we grab a state of cellular evolution every 20 steps. A,B,C,D of fig.2 are the state of T = 20, T = 40, T = 60, T = 100 respectively. Since the setting of the initial cellular value

is relatively random, the program runs different each time, but the basic evolution are presented the same as Figure 1 and Figure 2. The strongest possibility of group events occurring is in the initial stage of the

public opinion evolution which is in the first $T = 20$ time steps. The cellular numbers of opposite and support views are all reduced over time. But the number of cellular holding a neutral view increased. The cellular evolution is terminated at the time step of $T = 100$. There are still some cellular which support or opposite the views in the cellular space. If it expired the information distance, the public opinion cannot continue to absorb the neighbor's information to change the cellular state.

4. The influence factors of network public opinion triggered group events

4.1 The Half-life

After news published online, the views of the first 24 hours accounts 25% of total visits, and the next day the visits will be significantly decreased, which is only 7% of the total visits [11]. Therefore, from figure 1 and 2, we find that the probability of the occurrence of mass incidents is higher in the initial stage of the evolution of public opinion. Cellular individual will change a lot because of being affected by the surrounding views held by individuals. However, with the evolution of conduct, the numbers of the cellular individuals which get the support or opposite states are all on the decline.

This means that, for public opinion, people gradually lose the "freshness" of the event information they have acquired. Once the half-life of public opinion disseminated has been reached, the information does not have the value of being transfer and the group events disappeared either. If we do the human intervention in the case of public opinion, the half-life of public opinion can be shortened artificially. Once public opinion events occur, we should seek reasonable way to announce the public opinion as soon as possible, to speed up the half-life of public opinion, in order to avoid mass incidents, or to shorten the occurrence time of the public opinion events.

4.2 Psychological Convergence

The Internet age makes the immediate measure of individual behavior and emotions became possible [11]. It shows the individual social psychology changes through the portrayal of the social behavior through the "electronic trace". In fact, the response of individuals to the events is the emotional catharsis, rather than the public interest and public Maintenance responsibility [3]. In our public opinion cellular model, it manifested the information release between cellular and impact on the surrounding unit cells.

"In the destruction of social benefit mechanism, when the life structural strain, undermines people's life stability requirements, the masses would be reasonable to require a spontaneous sexual passion soci-

ety into irrational state social revolt among the population movement." Netizens' Group Psychology exists in the irrational stage. The Internet users with the same idea are very easy to get a sense of belonging and then form a network of groups. The individuals' feelings are very easy to be implied by the emotional infection [12].

Therefore, timely reduce of the psychological convergence of public opinion group events "catalyst" is one of the important ways to avoid group events.

4.3 Media Network

Media network has facilitated the transfer of public opinion, and also increased the information distance of the public opinion delivered process. In the traditional media, such as newspapers, magazines and other public opinion, information has been transferred on the single propagation mode without interactive. The interaction of both online and offline has also forms the multi-dimensional and the multi-center communication model, build a "fragmentation" of the spread of eco-[3]. In fact, individuals have different careers, interests, hobbies which are belonging to heterogeneous groups. The "random walk" phenomenon makes the individual shuttle to different interactive media network so that the individuals are very easy to find "like-minded" individuals in heterogeneous groups form homogeneity groups.

The individuals formed the homogeneous groups will feel an unstoppable force, which prompted them to dare to vent their instinctive desire. This desire must be restrained when they are alone [3]. Under cover of the network, homogeneous individual remove the mask, no longer subject to social morality, ethics, legal and moral constraints, and everyone's social responsibility is missing. In the traditional information media stage, there are some difficulties of public opinion if we cut off the "information distance" of the media which can prevent the occurrence of group events. But in the presence of phase media network, it's impossible to prevent the dissemination of public opinion and the occurrence of group events from the cutting off of information distance.

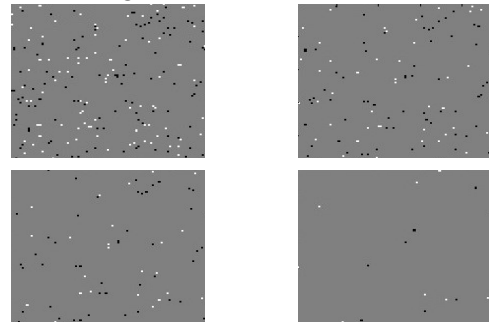


Figure 2. Evolution of Cellular individual state changes over time (partial data)

We need to publish the real information of the events through the authority media and the timely feedback of the public voice in order to avoid mass incidents in some degree.

5. Conclusions

We regard the cellular automata (CA) as a tool to study the online monitoring of network public opinion triggered mass incidents. Through the simulation, we found that the initial stage of public opinion transmission usually decide the occurrence of mass incidents. However, the survival of network information "half-life", as well as the public opinion to participate in the individual psychological convergence often becomes the main factors influencing the mass incidents. Therefore, in order to avoid the generation of mass incidents, we can shorten the half-life of public opinion information and announce the information timely.

But, there are also some shortcomings of this study. Due to the variability of individual existence, individual information "distance" is also variable so that the state of the eight neighbor cell participated in the public opinion information exchange will also change over time. So, how to describe the change of "information distance"? This will also become the focus of the follow-up study.

Acknowledgments

This work was supported by the MOE (Ministry of Education in China) Project of Humanities and Social Sciences No. 13YJC630178, the Jiangsu Province Social Science Fund No.14TQC002, Jiangsu Province Education Science "Twelfth Five Year Plan" key funding issues No. B-a/2013/01/021, the National Natural Science Foundation of China No. 71271120, the Jiangsu provincial government scholarship program.

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