

Research on the Construction of Information Control System of Crisis Decision

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Abstract — To assist the crisis decision, the construction of information control system is researched in this paper. The paper proposed a public crisis warning information control system based on current Web 2.0 environment in order to improve crisis analysis performance and provide decision support. Based on the data analysis, this SVM-based information control system is reasonable and effective. The empirical analysis suggested that performance of public crisis warning information control system can fulfill the technical requirements.

Keywords - construction of information control system; crisis detection; SVM-based; Web 2.0 environment

I. INTRODUCTION

With the advancement of economic globalization and political landscape diversity, the world is entering the unprecedented peak period of crisis. Currently, The sudden public crisis in our country have entered frequent events period and it presents characteristics of area expansion, scale expansion, harm expansion and expansion of chain reaction, which challenges the government's ability of emergency management. In addition, new problems have emerged. Recently, network public sentiment has fueled the spread and impact of public crisis, which is not only difficult to control but also hard to prevent; secondly, events like "Red Cross & Ms. Guo", which aroused the public's attention and damaged the credibility of the government, become a new type of public crises. Emergency crisis management is a major social and political issue, which we have to pay sufficient attention to address and confront. Crisis management is the core of the crisis decision-making, which not only requires the support of information management, but also needs information mechanisms as a safeguard; therefore, the research of information issues in crisis management and information safeguard mechanism to achieve emergency decision-making can facilitate the improvement of crisis management theory, which has great theoretical significance and practical value.

Gui's [1] paper based on the review and the present situation, from the perspective of information problems' domain in decision making scenario at different stages of decision, they divided information problems' domain into information management basic function problems and mechanism of action problems. Applying event chain theory, catastrophe theory, social networks analysis and system dynamics methods, he conducted a deep and systematic research about constituent elements, practice processes and mechanism problem of the information safeguard system on government crisis decision.

Based the theory of crisis life cycle as logical starting point, from the perspective of crisis management process, analyzing and discussing decision-making scenario model and information demand at different stages of crisis

management, on this basis, Deng [2] builds an information management dimensional framework for the crisis decision-making of government. Based on interpreting the government crisis monitoring system, he analyzed the function mechanism of the government crisis information's monitoring mechanism, and through the analysis and research of the crisis event monitoring practical and its information monitoring process, he put the countermeasures and suggestions of crisis information monitoring.

Based on defining the concept of information early warning, combined with the demand of government crisis decision-making to information early warning, we put three stages model of public crisis' information early warning, and according to the main function which supports public crisis' information warning process, Gui [3] build information early warning mechanism corresponding with the main function. Finally, taking the public crisis event--Ya'an earthquake in 2012 as an example, he analyzed the important role of information early warning mechanism in government crisis decision-making.

Based on analyzing and combing the information communication process model, Cheng [4] discussed the factors of crisis information communication and the factors influences them, proposed the mechanism framework of crisis decision-making information communication, based on the affiliations background of "information source-event", combined with the internet information source of information dissemination in domestic 14 Bridge collapses events recent years, he built network of information relationship, which was based on subject events, measuring the topologies of the information relationship network. Mapping out the relationship of status between different network sources by analyzing cohesive subgroups, revealing the core information groups, which are domination status in emergencies, hoping provide theoretical guidance for Information control system monitoring, public sentiment controlling and managing, core information sources identifying, key nodes controlling. According to the construction principle and its elements of coordinated security system, Zhang [5] proposed to build an overall

framework based on integrated and coordinated linkage framework, which is based on an information system linkage mechanism and overall architecture of platform for crisis decision-making information coordinated-joint systems. On this basis, he analyzed the important role of crisis decision-making coordinated mechanism.

II. INFORMATION CONTROL SYSTEM OF CRISIS DECISION IN CHINA

Since the early 21st century, globalization brings a new crisis gradually revealed. Both developed countries and developing countries, are faced with an inevitable problem, namely the emergent crisis events has become the major issues of global attention. People realize the importance of crisis decision-making and the government's crisis decision-making important support role of situational awareness of information, but from the current situation of the network information security situational awareness and crisis decision-making theory research and technology support, but the government's crisis decision-making information situational awareness research development is relatively a big lag, the frequent occurrence of crisis and the lack of research cases, the situational awareness of government crisis decision information research has a realistic significance.

Information is a universal variable to influence crisis decisions. The various factors of crisis decision-making scenario distributed randomly, and the relationships between these factors are also complex. With the events developed from low uncertainty to high uncertainty gradually, there appears new factors and information. From dispersed to polymerized, fuzzy to clear of all kinds of information, the requirements of importance and timeliness for the cognitive ability of crisis decision-making importance are different, which obviously increases the difficulty of decision-makers to analysis and assess the elements and information of crisis decision-making. Therefore, we should face urgently and consider seriously to the information problem of crisis decision-making and propose some solutions.

Crisis Information Management as a starting point for all activities of crisis management, running through all crisis decision-making scenarios, linking the various crisis management stages. The goals and tasks of crisis information management is a solid information foundation of crisis information management. Crisis information management mechanism is a guarantee for crisis information management to show value function and achieve crisis management, which is based on information management, at this point, the "axis" of crisis management, crisis management information and core message mechanism of crisis management information is consistent, they constitute a loop, which sets "crisis decision-making" as the axis and running through crisis management's beginning and ending, in order to understand and grasp the crisis information management in general, Zheng's [6] paper proposes dimensional analysis framework for crisis information management, which core concept is to led crisis management based on the whole process of information management and achieve crisis

decision with the protection effect of information management mechanisms.

From the evolution of public emergencies, there are many uncertain factors. Monitoring crisis information is the most important job to risk identification and prevention. Monitoring crisis information is the most basic step of crisis management crisis before the incident happened, which is also a prerequisite for crisis information warning, which affects response and ability to take actions of related subject in quality level fundamentally.

Public emergency warning plays an important role for the government crisis decision-making, but the key to ensure the effectiveness of information warning is to establish a sound mechanism for crisis early warning information. Information warning mechanism construction has become an important issue in modern society information management and innovation.

Information communicating plays an important role in the process of government crisis decision-making, perfecting the information communication mechanism is a process guarantee to deal with various crisis problems scientifically and effectively, and is also an important part of information management mechanism of crisis decision-making. Facing the public emergencies, we need to establish a linkage mechanism, which is based information coordinate and integrate system, and integrates the crisis power resources of different regions, different departments, different information systems and different levels, to achieve the coordination and linkage of crisis decision-making among governments, systems and departments truly. In the process of crisis information management system, the above mechanisms are not only separated with each mechanisms function, but also related closely, effected mutually, restricted respectively, and form overall mechanism of the crisis information management.

Human beings in the 21st century, under the background of information age, and social development to speed up the process at the same time, the government is facing the risk society crisis management difficulty. How to use effective ways to solve social development associated with the risk of phenomenon is increasingly becoming the core content of the government's administrative work.

Crisis self-organizing system model is established. Analysis of crisis phenomenon, the structure and function of self-organization system, and through the construction of crisis decision-making control is researched by simulating the characteristics of the present situation of the development and changes of crisis phenomenon. And arrive at crisis phenomenon development and change from disorderly to orderly best point. Crisis decision information control system according to the storage of code.

By construction of crisis decision-making network information center, it is to establish ability of crisis decision-making information transmission, control, supervision, management and execution of integration, instantaneous, accessibility of the decision support system, in order to realize the government and the people co-government risk society the new mode of crisis management. The functions of the government are to a service-oriented, contracted,

civilians and legislation shift. The essence of intuitive method of phenomenology, i.e. the crisis phenomenon implication studies the crisis phenomenon exist law issue, to ensure that the correct recognition of the problem of the crisis, according to the essential characteristic of crisis phenomenon, the dynamic nonlinear, by using the self-organization theory. It is obvious that crisis change from disorderly state is a kind of self-organization of parameter as caused to the end.

III. CRISIS EARLY WARNING MODEL FOR INFORMATION CONTROL SYSTEM

There are two common methods of online public crisis crisis early warning model including the method of content analysis and crisis measurement method. Crisis content analysis is the application of content analysis method in the Internet space as well as research on content analysis technology based on network environment. With increasingly and frequent modern network information exchange in recent years, crisis content analysis method plays an important role. In recent years, crisis measurement method which is an objective evaluation of the crisis link feature and method of quantitative information for site traffic analysis is widely used in many fields such as scientific information exchange such as search engine, Web site evaluation and so on.

The model conducted quantifies principal component analysis and support vector machine method of 15 original indexes and results of principal components analysis are put into an input to support vector machines method.

According to regression mathematical algorithms, mathematical regression function based public warning is as follows:

$$y_i = f(x) = w \cdot \Phi(x_{ij}) + b_i \tag{1}$$

According to procedure based on support vector machine regression prediction model, we can get SVM model for public crisis early warning:

$$y = \sum_{i=1}^n (\bar{\alpha}_i - \bar{\alpha}_i^*) K(x_i, x) + y_i \cdot \sum_{j=1}^n (\bar{\alpha}_j^* - \bar{\alpha}_j) K(x_i, x_j) \pm \varepsilon \tag{2}$$

We performed preliminary experiments to identify and solve public crisis early warning when using Gaussian RBF kernel function. The result is good and predicated value is relatively accurate. So this article conducted Gaussian radial as basic functions to build early-warning model based on support vector machine regression:

$$y = \sum_{i=1}^n (\bar{\alpha}_i - \bar{\alpha}_i^*) \exp \left[-\frac{|x_i - x|^2}{2\sigma^2} \right] + y_i \cdot \sum_{j=1}^n (\bar{\alpha}_j^* - \bar{\alpha}_j) \exp \left[-\frac{|x_i - x_j|^2}{2\sigma^2} \right] \pm \varepsilon \tag{3}$$

In order to accurately describe the effect of early warning model, the article uses some quantitative evaluation on prediction model of prediction accuracy evaluation which is necessary. In regression analysis, the accuracy of model predictions are often reflected through errors, such as the mean square error, mean absolute error and the mean absolute percent error. Their formulas are as follows:

$$MSE = \text{sqrt} \left(\frac{\sum e_n^2}{N} \right) = \text{sqrt} \left(\frac{\sum_{n=1}^N (x(n, true) - x(n, pred))^2}{N} \right) \tag{4}$$

$$MAE = \text{sqrt} \left(\frac{\sum |e_n|}{N} \right) = \text{sqrt} \left(\frac{\sum_{n=1}^N |(x(n, true) - x(n, pred))|}{N} \right) \tag{5}$$

$$MAPE = \text{sqrt} \left(\frac{\sum |e_n / x(n, pred)|}{N} \right) = \text{sqrt} \left(\frac{\sum_{n=1}^N |(x(n, true) - x(n, pred)) / x(n, pred)|}{N} \right) \tag{6}$$

MSE, MAE and MAPE are three key indicators to evaluate the predictive accuracy of the model. Their values reflect the size of the real level of discrepancies between model predictions which is the important indicators to evaluate models. In online public crisis crisis early warning model, smaller their values are, smaller the difference obtained from the model predictions to the real value is. And this illustrated the higher the accuracy of the model and had better warning effect. The various factors of crisis decision-making scenario distributed randomly, and the relationships between these factors are also complex. Crisis information management mechanism is a guarantee for crisis information management to show value function and achieve crisis management. Figure 1 shows the structure of SVM.

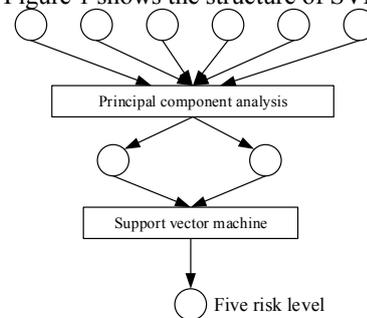


Figure 1. The Structure of SVM.

IV. EXPERIMENT STUDY

Value range of Internet public crisis crisis level is respectively determined according to the following table 1.

(1) Basic handling idea

The paper conducted analysis about Information control system crisis warning indicators that will judge the indicators is negative or positive. The value of positive indicator is big and its value of crisis degrees is big. The value of negative indicator is big and its value of crisis degrees is small. When analyzing the data in a model, we often process data of dimensionless which is converted data into 0 to 1 in order to improve the availability of data.

(2) Positive indicators handling

The value of positive indicator is big and its value of crisis degrees is big. In the support vector machine regression prediction model, normalizing formulae is as follows:

$$x_{ij} = (x_{ij} - x_{min}) / (x_{max} - x_{min}) \tag{7}$$

(3) Negative indicators handling

The value of positive indicator is big and its value of crisis degrees is big. In the support vector machine regression prediction model, normalizing formulae is as follows:

$$x_{ij} = (x_{max} - x_{ij}) / (x_{max} - x_{min}) \tag{8}$$

The training set of model 36 group by 8 main components constitute of vector. The output is score of crisis grade on this 36 time node by industry expert. The model trains a support vector machine model through program of learning training. We predicated the crisis grade in October 1 to October 7 through the model and compared them with real score by 7 experts, then we can obtain errors percentage and changes trend situation respectively. Figure 2 and Figure 3 are the expectations on the training set and testing set prediction results of the comparison.

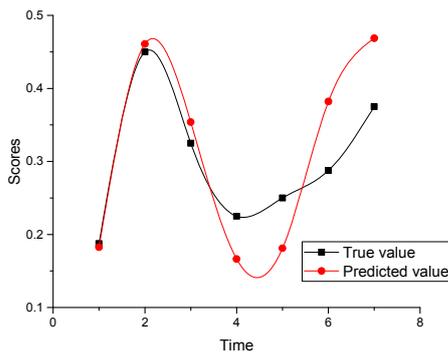


Figure 2. Comparison of Model Predictions of Training Set.

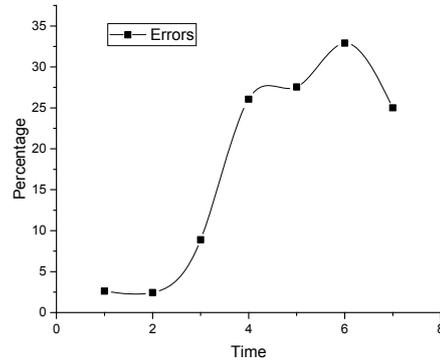


Figure 3. Comparison Results of Model Training Set.

Experimental results show that MSE of the model is 0.019601, MAE of the model is 0.12908 and MAPE of the model is 0.66221. The test result error of indication in training model is relatively high. From Figure 2, we can see that the Information control system crisis warning model in learning process is special good when crisis degree is greater than 0.5. Information control system of crisis warning is timely found big crisis degrees of public crisis event and reacted timely and reduced dangerous. The Information control system crisis warning model in learning process is just so when crisis degree is less than 0.5. But basic trend roughly is the same. Related sector need not too concern on this situation. On this point, the warning model also is compared practical and has must useful value.

From the experiment result, we can conclude that:

(1) Information control system of crisis warning is an item in real-time. Due to the big original data, so the model needs large support of computer like network reptile, information retrieved, theme mining and emotional analysis and other tools and optimizes effect and efficiency of data they obtained constantly.

(2) Public crisis can be divided into five levels: no alarm, mild alarm, central alarm, severe warning and a huge police intelligence. Relevant departments should monitor the use of public crisis and set the crisis threshold. When exceeding a certain threshold, relevant departments began to pay attention to the public crisis and take appropriate measures according to the crisis early warning model.

When the crisis degree is less than 0.5, this indicates that the event is in a state of alarm-free or mild alarm. Then we should pay close attention to the crisis of the trends of the curve at this time and warn of curves rising rapidly. This may be the harbinger of crises before they occur, and then we must analyze the reasons for this situation and make timely guidance to public crisis and prevent the crisis from happening.

When the crisis degree is greater than 0.5, public crisis event of dangerous period public crisis event against degree has reached related sector concern of degree which needs to do prepared work of the crisis. The purposes of information control system is timely to find crisis grade over a must value of Information control system event. The paper set the

value in the public crisis event of crisis degrees to be 0.5. When the crisis degrees is greater than 0.5, we must launch alert, make action quickly, analyze reason timely, take appropriate emergency measures, eliminate people of discontent mood in order to prevent the crisis of public crisis rising continuously and cause great and dangerous event.

When the crisis degree is greater than 0.9, it indicates that the event dangerous grade is very high. If it is not processing timely, it may cause social of unrest and hearts of extreme fear and led to some violence behavior. At this time, all related sector are to joint up and inhibit situation of further. The best practice is to tell the public truth and punish involving people or introduce policy, eliminate people heart of anger timely and transfer people on public crisis event of concern slowly. Both developed countries and developing countries, are faced with an inevitable problem, namely the emergent crisis events has become the major issues of global attention. People realize the importance of crisis decision-making and the government's crisis decision-making important support role of situational awareness of information, but from the current situation of the crisis information security situational awareness and crisis decision-making theory research and technology support, but the government's crisis decision-making information situational awareness research development is relatively a big lag, the frequent occurrence of crisis and the lack of research cases, the situational awareness of government crisis decision information research has a realistic significance. In addition, an old lesson can prevent similar crisis from happening again.

In this experiment part, we use crisis phenomena in the study self-organization feature change phenomenon, modeling system of informatization, and preliminary building crisis decision-making information control system for the feasibility of the control, based on the social construction of crisis decision making in risk control, system management significance, to solve the current situation of the phenomenon associated with the risk of social development. It is the development of the government and the public crisis work management mode, through the system engineering control theory, and it preliminarily submitted the argument of building a network-crisis decision-making information services sector, crisis decision-making office automation sector, crisis decision-making support, and crisis decision-making security management sector risk-based approach in all areas of society and industry, one-stop crisis decision-making management, crisis decision-making between government and citizens interact, interactive decision-making and legal supervision interactive innovation crisis management mode.

V. CONCLUSION

In recent years, crisis measurement method which is an objective evaluation of the crisis link feature and method of quantitative information for site traffic analysis is widely

used in many fields such as scientific information exchange such as search engine, Web site evaluation and so on. To assist the crisis decision, the construction of information control system is researched in this paper. The paper proposed a public crisis warning information control system based on current Web 2.0 environment in order to improve crisis analysis performance and provide decision support. By construction of crisis decision-making crisis information center, it is to establish ability of crisis decision-making information transmission, control, supervision, management and execution of integration, instantaneous, accessibility of the decision support system, in order to realize the government and the people co-government risk society the new mode of crisis management. Based on the data analysis, this SVM-based information control system is reasonable and effective.

From the experiment, it is concluded that information control system of crisis warning is timely found big crisis degrees of public crisis event and reacted timely and reduced dangerous. The Information control system crisis warning model in learning process is just so when crisis degree is less than 0.5. But basic trend roughly is the same. The empirical analysis suggested that performance of public crisis warning information control system can fulfill the technical requirements. The functions of the government are to a service-oriented, contracted, civilians and legislation shift.

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