Construction of film and television information dissemination model based on grey clustering algorithm

Yonghui Wang[a,*], Mengxi Zhang[a]
[a]Nanchang Institute of Technology, Nanchang 330044, Jiangxi, China.

ABSTRACT

The mode of film and television information dissemination has undergone great changes under the promotion of social network information technology. The disseminators of film and television information have changed from single production information in the past to multi-channel release information now, from simple text information to various forms of multimedia network information interaction. This paper attempts to build a film and television information dissemination model based on grey clustering algorithm, and sorts out the application in film and television information dissemination according to the time development order, and summarizes the development process and mechanism of film and television information dissemination model. The simulation experiment is used to simulate the film and television information dissemination process of information in this network, which proves the practicability of this model. The research results show the changing trend of the number of final nodes in the unobserved state S state with P value under different μ values. When μ=5.5, with the increase of P, that is, the proportion of group effect of group heat information in film and television information network in decision-making gradually increases, the final number of people who have not watched it gradually decreases, and the final spread range of film and television information gradually expands with the increase of the proportion of P value.

Keywords: Grey clustering algorithm; Video information; Propagation model

1. INTRODUCTION

We live in an information age, where various types of information fill our daily lives. With the rapid development of the Internet today, social networks have become an indispensable part of people's daily life. People actively participate in the interaction of social networks, express opinions on social networks, participate in the discussion of entertainment gossip, and disseminate information. This has made online social networks such as Weibo and circle of friends increasingly influential. The mode of film and television information dissemination has undergone significant changes driven by social network information technology. The disseminators of film and television information have evolved from the past single production information to the current multi-channel release of information, from simple text information dissemination to various forms of multimedia network information interaction[1]. During this process, users will be influenced by other friends on the network and take corresponding actions. When friends start recommending a movie or TV series, the user will choose to watch it with a certain probability. At the same time, the recipients of film and television information have changed from passive acceptance of information in the past to active creation of information now, from single acquisition of information to comprehensive utilization of information, and from individuals receiving film and television information to groups of information exchange [2]. At the same time, the dissemination of film and television information is closely related to people's lives, affecting the realization of social values, security and stability. The process of film and television information dissemination is complex and has many influencing factors. Therefore, based on the analysis of monitoring data on the network film and television information dissemination of mainstream media websites, how to interpret the dissemination laws, influencing factors, and internal relationships of film and television information is the core issue to be addressed in revealing the mechanism of film and television information dissemination [3].

*E-mail: 2006112@nut.edu.cn

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As a form of entertainment and communication, microblogging or circle of friends is not an isolated individual behavior, but rather involves interpersonal relationships and social interaction, which is the result of peer influence. The effective participation of users in the entertainment process has promoted the entertainment activity itself and promoted the extension and recreation of comments, forwarding, and even entertainment in online social networks. By proposing a film and television information dissemination model based on gray clustering algorithm, this article summarizes the evolution of traditional models and inspires new models for film and television information dissemination. Its applications in film and television information dissemination are sorted out in chronological order, and the development process and mechanism of film and television information dissemination models are summarized. Research on the laws of information dissemination among users can lead to research results that can provide effective information services for social network users, and play a significant role in information regulation and public opinion guidance related to national security and maintaining social stability[4].

2. RESEARCH ON FILM AND TELEVISION INFORMATION DISSEMINATION MODEL

2.1 Mean field analysis of small-world network

The double profit generating mechanism and double marketing mode of TV media enterprises determine that the value chain of TV media enterprises is centered on content products and revolves around value-added links such as communication channels and advertisements. Effective value chain management of TV media enterprises is to ensure its public opinion function and develop in both the audience market and the advertising market [5]. Users will be affected by peer effect and time-varying group effect when they are not watching, in which the decision-making ratio of group effect is P. After watching, the user will choose whether to spread according to the quality of the film and television drama, and it will become a spreading state with probability β.

2.1.1 Analysis of mean field model

The influence of TV media enterprises can be gradually improved through effective sales for many times, and finally the brand of TV programs and even TV media enterprises can be formed. TV media enterprises can realize the horizontal expansion of the value chain with the help of brands. In view of the entertainment and film information dissemination model, the average field analysis can be used to explore the relationship between the final dissemination range and various parameters on the small world network. In the social network, a certain video information released by a user will be received by other users with a certain probability. Every user in the social network is both a receiver and a disseminator of video information. Which users the video information spreads to in the social network is related to the social network structure and the social relations among users in the network [6]. In the process of propagation, nodes in each state will contact all connected nodes evenly at every moment, but only the change process from S state to E state depends on contact, and the transition of other states is only related to the current transition probability parameters. The state transition process of film and television information dissemination is as follows:

$$\begin{cases} \dfrac{ds}{dt} = \alpha < k \\ \dfrac{dI}{dt} = \beta E(t) \end{cases} \tag{1}$$

k represents the average degree of the network, α represents the probability that a peer successfully persuades the node to take a drama watching behavior, and β represents the probability that the drama watching node transitions to a propagation state.

In order to obtain the propagation threshold, i.e., to ensure that R is greater than 0, it is necessary to ensure that the value $F(0)<0$ (0) of d at $R=0$ for $F(R)$ is less than 0. Therefore, the propagation threshold finally derived on a uniform network such as a small world network meets the conditions shown in (2):

$$\frac{\alpha\beta}{\gamma} > \frac{1}{k} \tag{2}$$

In other words, in order for information to spread on a small world network, it is necessary to satisfy formula (2). In this section, the mean field analysis method is used to obtain the relationship between the final information dissemination range and the changes in various parameters of the model. Once the film and television information communicator comes into contact with the information receiver, it has the dissemination ability [7]. The probability that a propagation node can turn a susceptible node into a propagation node per unit time is proportional to the total number of information recipients in this environment at time t. We further verify the correctness of this analytical result through Monte Carlo simulation.

2.1.2 Monte carlo simulation verification

The open source of TV media products and the limited resources and capabilities of TV media enterprises make the competition of TV media enterprises more homogeneous, and the differentiation of TV media products is more and more difficult to achieve. In order to verify the correctness of the results obtained by the mean field analysis method, Monte Carlo simulation is carried out in this section. The network constructed by simulation is a WS small-world network with node number n of 2000. The model is used to describe those information dissemination scenarios that suddenly break out and lack effective control. For example, social crisis events, which have a huge audience, efficient information exchange and explosive growth, form online public opinion. See Table 1 for the default parameter values of the model. The reference sources of each parameter have been listed in the table, and several parameters mainly studied in the simulation experiment are set values. Subsequent experiments will study the different effects of different parameter values on the propagation results of the model.

Table 1. Basic parameters of simulation process

Parameter	Meaning	Numerical value
N	Number of nodes in the network	3000
I	Initial number of infected nodes	28
A	Peer infection rate	0.7
P	The proportion of decision-making in watching drama	0.66

Monte Carlo has a narrow scope of application, but it is a classic model from which all models are developed. This model is suitable for the case that the warehouse is simple, with susceptible nodes, propagation nodes and immune nodes, and the immune nodes have no chance to become susceptible nodes or propagation nodes again [8].

2.2 Grey clustering algorithm for film and television information dissemination model

The extension of the value-added link of the basic value chain of film and television media enterprises to the depth and breadth can enable TV media enterprises to enhance their capabilities through the extension of each business unit in the value-added link without or with less investment, thus generating greater value. Film information is a combination of language and context: film subtitles and dialogue between characters are language, while non-verbal information is context. Context can be divided into situational context and cultural context. The former includes stories, scenes, characters, costumes, lighting, shooting angle, lens duration and music style that can be intuitively perceived and cross-culturally general, while the latter refers to the background knowledge needed for logical reasoning from situational context, which is typical of the nation [9-10].

In this paper, a grey clustering algorithm is proposed to calculate the bias parameters of the video information propagation model, and the prior knowledge of the interdependence of data samples is injected into the bias video information parameters to improve the clustering efficiency and accuracy of the algorithm [11]. The value creation process of the value chain of the film and television information communication model is based on the value creation process of the basic value chain, adding links such as content creative production, program marketing promotion and program trading. The film and television information dissemination model is shown in Figure 1.

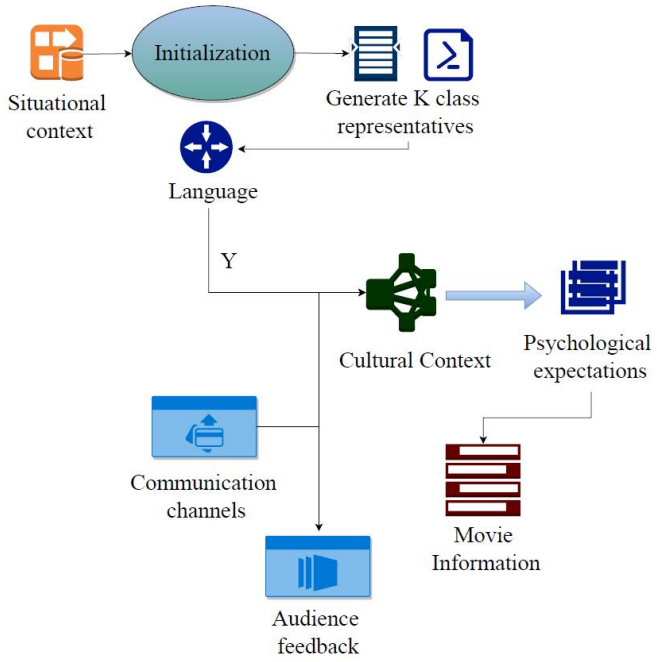

Figure 1. Film and television information dissemination model

The information output from movies through the above three forms during movie viewing will interact with the audience's cultural psychological schema, namely Fowler's "structured anticipation" mechanism. Due to the fact that the number of clusters generated by traditional algorithms is often larger than the actual number of clusters, resulting in inaccurate clustering centers and reduced clustering accuracy. This article conducts a necessary merging of the generated clusters. Note that D_i is the sum of distances between data samples in the i cluster, NUM_i is the total number of data samples in the i cluster, and T_i is the average distance between data samples in the i cluster, with

$$T_i = \frac{D_i}{NUM_i} \tag{3}$$

Sum of average distances of each cluster data sample

$$T = \sum_{i=1}^{K} T_i \tag{4}$$

The average distance between all data samples in dataset X is

$$d = \frac{dist(X)}{N-1} \tag{5}$$

Where $dist(X)$ is the weighted Euclidean distance.

According to relevance theory, value expansion activities are conducted on the cross section of certain value activities around the brand effect formed by television media products. Each business unit in the business flow revolves around the brand operation of a television media enterprise. Brand operation can develop new business areas and effectively prevent risks by cultivating new value-added links.

3. APPLICATION OF FILM AND TELEVISION INFORMATION COMMUNICATION MODEL

According to the classification of the value chain of film and television enterprises, most of the music for films and pictures is made through thousands of choices or long-term preparation based on the content of the film. Therefore, it is excellent popular music, and the more excellent the work, the more distinctive the aesthetic characteristics of its artistic image. This article integrates the value chain of TV media enterprises through the extension and expansion of the value chain of the film and television information dissemination model, forming a value operation system with content products as the core, television, radio, network, newspapers, books, magazines, CDs, and other communication channels, and through related links such as content creative production, promotion, trading, dissemination, audience feedback, and advertising. A multi-objective location model with the optimal overall conditions, maximum coverage, and minimum number of shelters as the objective functions was constructed. The model was solved using a mean shift clustering algorithm and the number and distribution of shelters were adaptively obtained. For new samples obtained online, it is necessary to first determine the subcategory to which they belong, and then predict the output based on the corresponding sub model.

Once a film and television information product is sold, its ownership is transferred from the producer to the broadcaster. If the transaction result does not enable the television media enterprise to obtain satisfactory revenue, then the television media enterprise may reduce its creative production budget or change the type of television media product, or even completely abandon the television media product transaction process and focus solely on product production to complete the production and broadcasting of the film and television media product. The peer effect generated by friend recommendation works through the contact of the network, and users will change their behavior according to the peer recommendation information. However, there are still influential factors in the network that do not rely on direct contact, such as we media, microblog, WeChat official account and other emerging media, but these studies do not consider the group influence on the network. Generally, the similarity with each cluster center is calculated and classified into the category with the greatest similarity. In the future competition, enterprise advertising operations through the film and television information dissemination model must focus on innovation in business thinking and models, achieve multi link value-added in the value chain, and increase revenue through diversified business methods such as film and television media enterprise brand organization activities or consulting activities aimed at advertisers.

4. SIMULATION STUDY

In the value chain of film and television information dissemination, the transaction of film and television products is a very important link. The transaction of film and television products has experienced a gradual process from "communication" to "exchange" and then to "transaction". After the implementation of "separation of production and broadcasting", the importance of film and television product trading has gradually become prominent. Considering that the film and television information propagation model can't be analyzed by Markov, this paper uses the method of grey clustering algorithm simulation to study the influence of film and television information propagation dynamics.

As shown in Figure 2, the relationship between the peak occurrence time and the propagation range of the small-world network is shown. The μ value represents the peak occurrence time of the group effect heat function, and λ is directly proportional to the peak value of the function, so as to indicate the degree of the peak. Under the same peak degree, the final propagation range is in the range of $\mu = [1,15]$, and the propagation range of film and television information can reach the maximum value, which is about 1.57. As the peak of group effect appears later and later, the μ value further increases, and the final spread range also decreases, until the μ value exceeds 58, the information of film and television dramas basically cannot spread on the network.

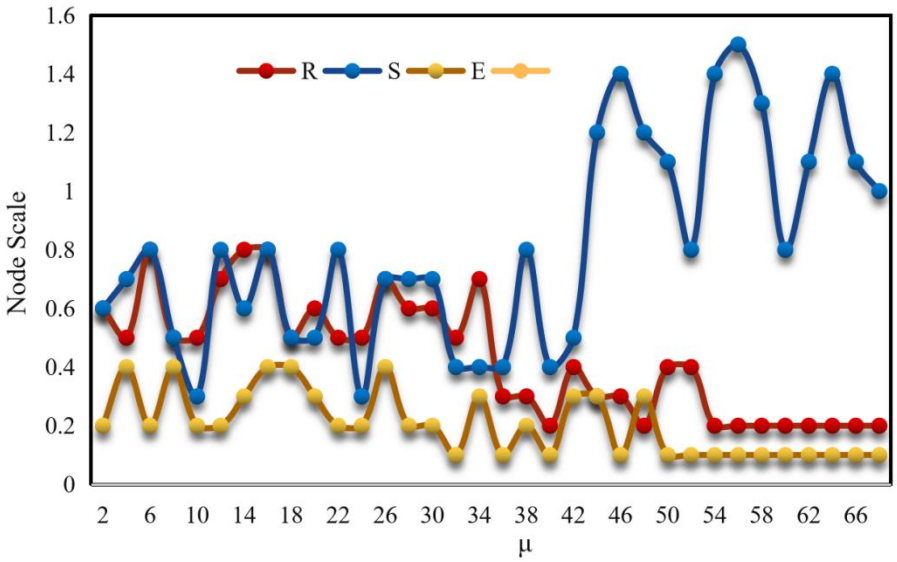

Figure 2. Relationship between peak time and propagation range of small world networks

As shown in Figure 3, the variation trend diagram of the spread range of video information with λ under different μ values on scale-free networks is shown. When μ=5, with the gradual increase of λ, the final transmission range is almost unchanged, but after μ gradually goes on, the overall trend of the transmission range of film and television information becomes smaller with the increase of λ. λ is closely related to the peak height of group effect, and the results show that the higher the peak height, the better. When λ is large, the peak value is high but the peak shape is narrow, and the group effect is short, which limits the spread of information to some extent.

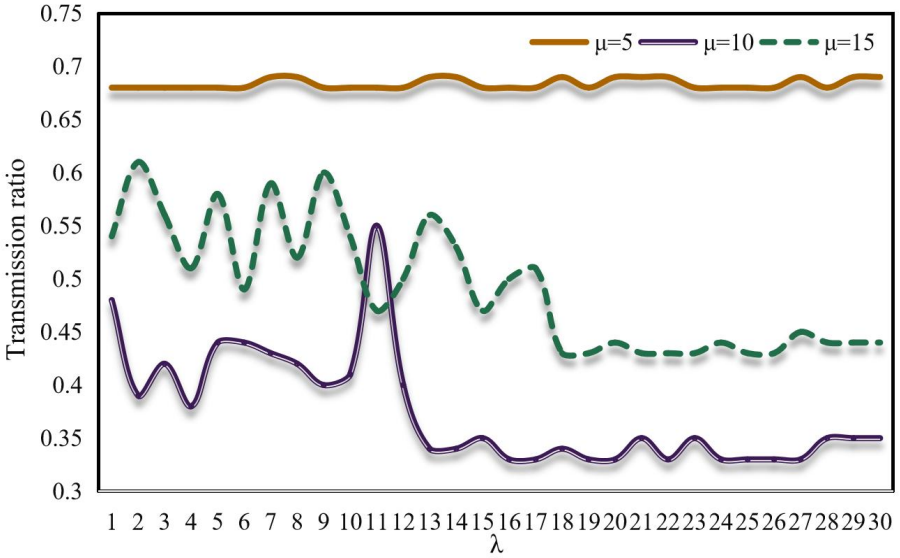

Figure 3. Different Scaleless Networks μ The propagation range varies with the λ Change trend chart of

As shown in Figure 4, the result is the change trend of the number of final nodes in the unseen state S with the p value under different μ values. As can be seen from the figure, when μ=5.5, with the increase of P, that is, the proportion of group effect of group heat information in film and television information network in decision-making gradually increases, the final number of people who have not watched it gradually decreases, and the final spread range of film and television information gradually expands with the increase of the proportion of P value.

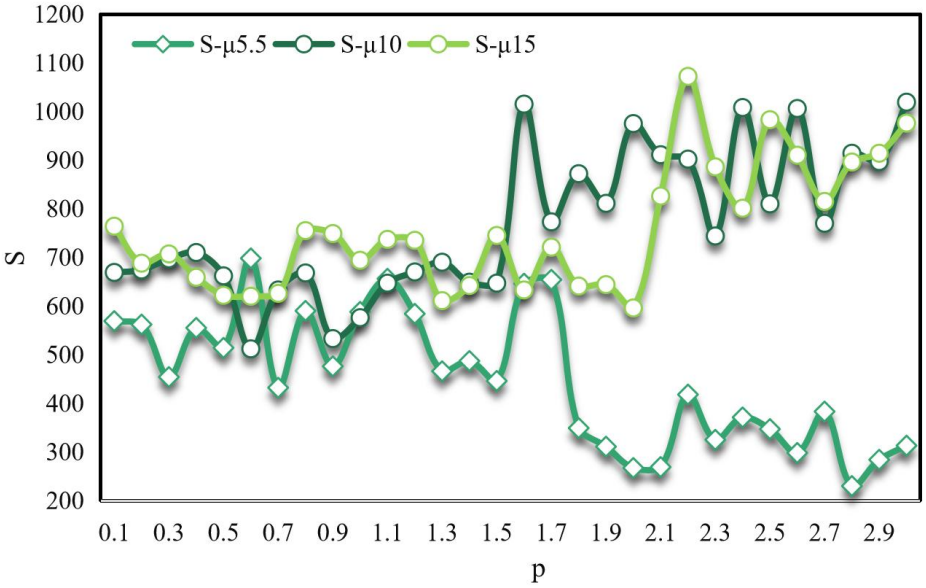

Figure 4. Relationship between the number of nodes in the final susceptible state and the p-value

In this chapter, in order to verify the scientificity and effectiveness of the model established in this article, verification experiments and simulation experiments on film and television information dissemination have been conducted. In the validation experiment, the potential relationship strength of film and television information was calculated, which proved the feasibility of the model. In this model, each value-added link coordinates with each other and extends along the horizontal axis to both sides. It can be seen that the value chain restructuring model of TV media enterprises is fully open to market space. Through resource integration and utilization, new value can be created, which constitutes a value-added link in the value chain of TV media enterprises. The identification and effective management of value-added links in the film and television information dissemination value chain can ensure the smooth operation of the film and television information dissemination value chain, thereby better realizing the value-added dissemination value.

5. CONCLUSIONS

Due to the change of competitive environment, TV media products have gradually changed from seller's market to buyer's market, which makes managers and employees of TV media enterprises not only care about the knowledge, interest and attraction of TV media products as before, but also consider how to develop TV media products to create greater value. In this paper, the search index of various types of film and television dramas is fitted, and the film and television information dissemination model is constructed based on grey clustering algorithm. The simulation experiment is used to simulate the film and television information dissemination process of information in this network, which proves the practicability of this model. The research results show the changing trend of the number of final nodes in the unobserved state S state with P value under different μ values. When μ=5.5, with the increase of P, that is, the proportion of group effect of group heat information in film and television information network in decision-making gradually increases, the final number of people who have not watched it gradually decreases, and the final spread range of film and television information gradually expands with the increase of the proportion of P value. Through the research of this paper, in the future competition, the enterprise advertising management through the film and television information communication model must pay attention to the innovation of business thinking and mode, realize the multi-link value-added of the value chain, and increase the income through diversified business methods such as brand organization activities of film and television media enterprises or consulting activities for advertisers.

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