

# A model for art communication and development under the influence of social network

## *Modelo de comunicação e desenvolvimento de arte sob a influência da rede social*

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### Abstract

Improving the value of art information and user behavior factors can boost the effect of art communication and development. This paper proposes a social network based on the S-SEIR (Single SEIR) art communication and development model, a new model developed based on the SEIR (Susceptible, Exposed, Infectious, Recovered) classical epidemic dynamics model. In addition, we present the concept and characteristics of art communication, summarize the rules of node classification and art information evolution, and design an interpretative S-SEIR model considering the value of art information and user behavior factors. The experimental results show that the model can clearly analyze the impact of art value and user behavior on the dissemination and development of art information, and has the advantages of high efficiency and accuracy.

**Keywords:** Art and communication. SEIR model. Social networking. User behavior.

### Resumo

*A melhoria do valor da informação artística e dos fatores de comportamento do usuário pode aprimorar o efeito da comunicação e do desenvolvimento da arte. Portanto, este artigo propõe um modelo de comunicação e desenvolvimento da arte S-SEIR baseado na rede social. Combinado com o conceito e com as características da comunicação artística, com base no modelo clássico de dinâmica epidêmica SEIR (Suscetíveis, Expostos, Infeciosos e Recuperados) considerando-se o valor da informação artística e fatores de comportamento dos usuários, é proposto o modo de comunicação e de desenvolvimento da arte s-seir baseado na rede social. As regras de evolução da classificação dos nódulos e da informação da arte são resumidas, e o modelo de comunicação e de desenvolvimento da arte S-SEIR baseado na rede social é projetado. Os resultados experimentais mostram que o modelo pode analisar claramente o impacto do valor da arte e o comportamento do usuário na divulgação e desenvolvimento da informação da arte e tem como vantagens alta eficiência e precisão.*

**Palavras-chave:** Comunicação e arte. Modelo SEIR. Rede social. Comportamento de uso.

### Introduction

In recent years, with the rise and development of the Web 2.0 technology, online social networking has become an important means for people to disseminate information and communicate with each other (Merkin;

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Taras; Steel, 2014). A social network is a comprehensive platform that provides diversified network services for Internet users. It can provide network application services such as making friends, sharing, entertaining, and chatting, as well as great convenience for people's information, communication, and dissemination. Following the popularity of Facebook and Twitter everywhere, social networks represented by Renren, QQ, WeChat, and Weibo have become well-known to netizens (Cañibano; Bozeman, 2015). With the increasing number of social networks and the increasingly rich user behavior, the process of information dissemination in social networks presents complex characteristics. Information is not disseminated on a single network, but in the environment of a variety of social networking applications (Peterie, 2018). The amount of information disseminated in each social network is huge, and the types of information found are rich and varied, including games, campus, friends, art, literature, science and technology, etc. With the advent of the Internet era, art communication is closer and closer to people's lives. Through the dissemination of the network, art information is transmitted to every audience with a demand for it. The scope of art communication is very wide, and its purpose is to communicate. The transmission of works of art to the audience includes artistic information, art communicators, and art media, which is the dissemination of art. Under the influence of social networks, art communication presents a new development trend (David; David, 2014; Kaplanski; Levy, 2018; Craik *et al.*, 2018; Canh *et al.*, 2019).

## **The concept of art communication**

With regards to the concept of art communication and its definition, various scholars in China provide different interpretations from their academic perspectives and fields. From a comprehensive analysis of the relevant discussions between different scholars on art communication, we can affirm that art communication is similar to the study of communication science, which mainly studies the process and general laws of art communication. Its research object refers to the process of transmission, spreading, and changing of art information, art works, and art activities in time and space, and then to art's popularization and publicity (Tröndle; Kirchberg; Tschacher, 2014). The essence of art communication is to summarize the general rules of the Arts in the current mass media, such as newspapers, films, networks, microblogs, and so on. Such general rules provide guidance to all kinds of arts and related debates, such as the relationship between art communication and artistic creation, the relationship between art communication and art reception, and the basic problems of art communication under the new mass media and the current conditions of technology replication (Olbrich, Schultz; Bormannm, 2018).

## **Features of art communication**

### *Artistry*

The first feature of art communication is artistry (Ruiter, 2015), which is exemplified by the lines and colors of painting and sculpture, and by the melody and rhythm of dance and music. This is the essential distinction between artworks and other objects, and the artistic nature of the reason why they become works of art.

### *Dissemination*

Art communication is a science that researches the propagation rule of art by communication science. Its second characteristic is dissemination. From the angle of reception aesthetics, if an artwork is not spread out, it is not received, appreciated or consumed by the audience, this piece is not really an artwork, and its value is not truly realized. So, dissemination is a primary feature of art communication.

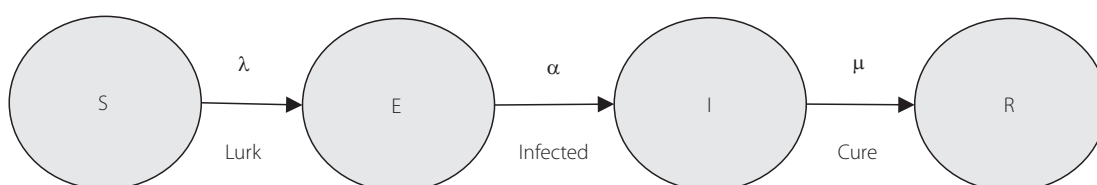
## Emotional resonance

The purpose of art communication is to foster mutual communication and understanding, which are the emotional resonance characteristics of art communication. In the field of art communication, emotional resonance is an important reason for communication between communicators and receivers (Berardo, 2014). Only when artworks meet the expectations of the recipient, can they better communicate with the public and produce emotional resonance. First of all, artistic creation is a kind of aesthetic creation activity facing others. Secondly, artistic creation is a kind of perceptual text facing the world. Finally, art appreciation is a kind of aesthetic recreation activity and the embodiment of the aesthetic value of artistic works. The purpose of art communication is communication, and the success of communication depends on the sympathy of communicators and receivers (Adams, 2014). With the continuous development of art communication technology, art intermediary agencies are constantly enriched and diversified. The positioning of art communication and the call for art receivers will inevitably bring about the industrialization of art.

## The SEIR model

In the SEIR (Susceptible, Exposed, Infectious, Recovered) model, it is assumed that the infection is delayed in the course of transmission. Susceptible people do not immediately become ill when they are infected – the individual is exposed to the pathogen, which waits to be activated. When the pathogen is activated, its carrier becomes an infective agent (Lie; Servaes, 2015). The model is proposed based on results of research on infectious diseases that were carried out with humans. Such results point that the cascade transmission of information on the Internet is very similar to the spread of disease in the crowds, and it can be regarded as a network communication behavior that obeys a certain rule (Jiménez-Martínez, 2015; Liu; Zhao, 2019). Therefore, using the model of infectious diseases outside its original field of studies, the art communication and development model is proposed to research the propagation law and behavior of art communication in social networks.

Assume that  $S(t)$ ,  $E(t)$ ,  $I(t)$ , and  $R(t)$  are the proportions of the susceptible person, the exposed person, the infective person, and the recovered person in the crowd. Rehabilitation refers to people who have certain appreciation abilities and have higher requirements for art. They are interested in higher-level art forms, and are hardly ever interested in common art forms, or even not interested at all. In the SEIR model, the transformation state of individuals related to different art forms is shown in the chart (Figure 1).



**Figure 1.** SEIR propagation model.

Note: S: Susceptible; E: Exposed; I: Infectious; R: Recovered.

Source: Elaborated by the authors (2019).

The SEIR model is expressed as follows:

$$\left\{ \begin{array}{l} \frac{dS(t)}{dt} = -\lambda I(t)S(t) \\ \frac{dE(t)}{dt} = \lambda I(t)S(t) - \alpha E(t) \\ \frac{dI(t)}{dt} = \alpha E(t) - \mu I(t) \\ \frac{dR(t)}{dt} = \mu I(t) \end{array} \right. \quad (1)$$

There are also differences between art communication and the development model under the influence of social network, on the one hand, and infectious disease transmission, on the other, which lead to shortcomings on the existing communication model. In order to address the problem of the existing communication model, an S-SEIR (Single SEIR epidemic model) social network model is proposed in this paper, which takes into consideration the user behavior and information value factors (Lin; Huang; Chuang, 2015). The influence of these factors on the art communication in social networks is researched.

## Hypotheses of the S-SEIR art communication and development model based on social network

### *Node classification*

In this paper, the user of the social network is defined as a node, and the relationship between individuals is abstracted as the edge between nodes, while the art information is spread along the edges. Combined with the process of user information dissemination in social networks, the nodes in social networks can be divided into 4 categories: susceptible nodes, exposed nodes, infective nodes, and recovered nodes (Gittins; Lang; Sass, 2015). Susceptible nodes indicate that there is a probability that users will receive the art information transmitted from their neighbors. Exposed nodes indicate that there is art information in the user's message prompt, but because the information is constantly updated, the node does not necessarily read the information. Infective nodes indicate that the user reads the art information transmitted from the neighbor node and disseminates the information. Recovered nodes indicate that the user is not interested in the art communication information or does not believe the information in the exposed node or the user who has disseminated the information. According to the classification and definition above, four states of users are defined as susceptible (S), exposed (E), infective (I), and recovered (R).

## 4 The evolution rules of art communication information

The cases in which the user will forward the art information and whether he or she will comment on it are problems that are difficult to rule on and that might limit the boundaries of the problem with various assumptions. The rules of evolution of art information in social networks are defined as follows. After the dissemination of the information of art communication by the node  $i$ , if the node  $j$  is a susceptible node, then it will be transformed into an exposed node with the probability of receiving the information of art communication; otherwise, it will be a recovered person with a probability  $\alpha$ .

The infective node forwards the artistic communication information in the social network with the probability  $\delta$  of becoming an infective node, and browses instead of forwarding the art communication information with the probability  $\theta$  of becoming the recovered node.

If the infective node loses interest in art information or distrusts the information, it will turn into a recovered node. The recovered node does not permanently reject art communication information. It will then be transformed into the infective node with probability  $\eta$ .

## Design of the S-SEIR art information communication and development model based on social network

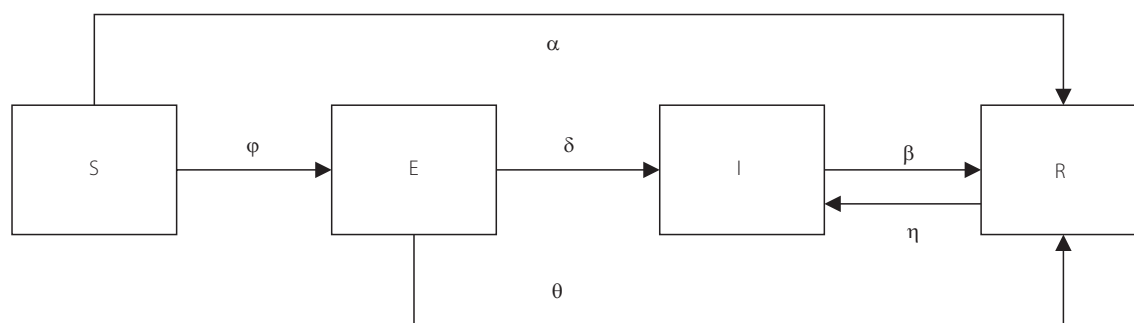
### The S-SEIR model design

The S-SEIR model of art information communication and development based on social network is designed in this paper based on the theory of communication and network dynamics and on the SEIR model, as well as according to the communication mechanism of social network art information (Coslor, 2016).

(1) This model proposes a new method to deal with exposed nodes and integrates them into the art information communication model (Abazov; Sunderbayev, 2015). In the traditional SEIR model, the node in the exposed state is directly transformed into an infective node with a certain probability, which is not consistent with node processing in reality. In the proposed model, one part of the exposed nodes is transformed into the infective nodes, and there is a chance that the other is transformed into the recovered node.

(2) The nodes in the recovered state are more flexible. In the existing model, such nodes can obtain life-long immunity. In reality, they can actually be converted into other-state nodes (Gummerus; Liljander; Sihlman, 2017). In the S-SEIR model, the susceptible node is transformed into an exposed node with a fixed probability, and in reality, the contents of the art information also affect the receiver's behavior.

(3) The value of art information is introduced into the model. Art information has a strong value of sublimating thought and cultivating sentiment. Therefore, we must pay full attention to it, and measure it from the spread speed, cultural value, and aesthetic value of art information. Among them, the speed of communication (spread speed) refers to the time required for art information to be transmitted to the receiver through different media. In the traditional model, sensitive nodes are transformed into exposed nodes with a fixed probability. In reality, the information content transmitted by art will also affect the behavior of the receiver. The S-SEIR-art information communication development model based on social network can be represented by state transition diagrams of different types of nodes (Figure 2).



**Figure 2.** S-SEIR art information communication model under different node states

Note: S-SEIR: Single SEIR electronic model. S: Susceptible; E: Exposed; I: Infectious; R: Recovered.

Source: Elaborated by the authors (2019).

In Figure 2,  $S \rightarrow E$  represents that after the publication of art information, the susceptible node becomes the exposed node for receiving art information from their neighbors, and the transformation probability is  $\varphi$ .  $S \rightarrow R$  represents that the susceptible node is not interested in art information or does not believe this information, and then becomes the recovered node. The transformation probability is  $\alpha$ .  $E \rightarrow R$  represents that although the node receives art information transmitted from neighbor nodes, it does not continue to propagate such information, thus becoming the recovered node. The transformation probability is  $\theta$ .  $E \rightarrow I$  represents that the node browses the art information and forwards it as the infective node. The transformation probability is  $\delta$ .  $I \rightarrow R$  represents that the infective node is transformed into the recovered node. The transformation probability is  $\beta_1$ .  $R \rightarrow I$  represents that part of the recovered nodes will be transformed into the infective node of art information dissemination with a certain probability  $\eta_1$ ,  $\delta + \theta = 1$ .

In this paper,  $N$  is the total number of nodes in the network. The number of newly increased and reduced nodes in a short time can be balanced. Therefore, assume the total number  $N$  of users in all states remains unchanged at any time.  $S(t)$  is the number of nodes in the susceptible state at the time  $t$ ,  $E(t)$  is the number of nodes in the exposed state at the time  $t$ ,  $I(t)$  is the number of nodes in the infective state at the time  $t$ , and  $R(t)$  is the number of nodes in the recovered state at the time  $t$ .

In the S-SEIR model, assume the number of nodes  $S(t)$  in the susceptible state at the time  $t$  is a continuous and derivable function. In every minute, there will be  $\varphi S(t)$  nodes receiving art information from neighbor nodes, and nodes not receiving art information. Then at the time  $t + \Delta t$ ,

$$S(t + \Delta t) - S(t) = -\varphi S(t)\Delta t - \alpha S(t)\Delta t \quad (2)$$

The differential equation can be obtained as:

$$\frac{dS(t)}{dt} = -\varphi S - \alpha S \quad (3)$$

The differential equations of  $E(t)$ ,  $I(t)$ , and  $R(t)$  were also obtained. Therefore, the model can be expressed by the differential equations given by:

$$\begin{cases} \frac{dS(t)}{dt} = -\varphi S - \alpha S \\ \frac{dE(t)}{dt} = \varphi S - (\delta + \theta)E \\ \frac{dI(t)}{dt} = \delta E + \eta R - \beta I \\ \frac{dR(t)}{dt} = \beta I + \theta E + \alpha S - \eta R \end{cases} \quad (4)$$

In equation (4), the change rate of the susceptible node, the exposed nodes, the infective node, and the recovered node with time are expressed in turns. The dissemination of art information is affected by many factors from publication to user browsing. Therefore, the transfer between two states cannot be expressed by a single probability (Bertola; Patti, 2016). The value of art information  $V_0$  will affect the attraction of information to users in the process of dissemination. Because art information is characterized by a brief period of enthusiasm, the timeliness of the value of art information should also be taken into account.  $\lambda$  is used to express the timeliness characteristic

scale factor of art information dissemination (Luarn; Yang; Chiu, 2014). In order to facilitate the model building, the following definition is given:

Art information attraction function  $\varphi(t)$ : The preference degree of art information received by the node, that is, the transition probability from the susceptible node to the exposed node, expressed as:

$$\varphi(t) = V_0 * e^{-\lambda t} \quad V_0 \in (0,1) \quad (5)$$

where  $V_0$  is the value of art information. There is no uniform definition of the value of art information. In this paper, it represents the importance of art information to users. The value of art information is expressed by the number in  $[0,1]$ . 0 represents art information is worthless and 1 represents the greatest value of art information.  $\lambda$  reflects the degree of attention of the art information on the website.

### Parameter signification

In the designed model, a number of parameters are set. The basis and the signification of the settings are described as follows.

Parameter  $\varphi$ : After the publication of the art information, on the one hand, it is impossible to be completely accepted by the user, and the topics and interests vary for each user, so there will be some level of difference. On the other hand, in the process of disseminating art information, there are periodic stages, and the transmission ability of art information is different at different stages through the process of dissemination (Yaakobi; Goldenberg, 2014). Therefore, the parameter  $\varphi$  is to describe the different propagation efficiencies produced by the evolution of time and the value of art information.

Parameter  $V_0$ : The value of art information can contain three meanings: One is the hotspots of art information. The second is the coincidence of the content of art information with factors related to user behavior. The third is the influence of art information disseminators, such as the homepage of celebrities and the familiarity of users.

Parameter  $\lambda$ : Timeliness scale factor of art information. Because of the complexity of network information and the limitation of users' attention to art communication information, this parameter characterizes a brief period of enthusiasm toward art information in the network.

Parameter  $\alpha$ : In the social network structure, some nodes are not interested in any art information, constituting inactive nodes. They transform from susceptible nodes to recovered nodes with the probability  $\alpha$ . The value of  $\alpha$  affects the activity of the network.

Parameter  $\delta$  and  $\theta$ : If the nodes browse the art information, they become exposed nodes. If nodes choose to share or forward it, then the process of the continuing propagation of art communication information is carried out on the website (Ramse; White, 2015). If the node feels that the art information is not necessary enough to keep forwarding it, the node will choose not to do any processing of the art information, thus turning into a recovered node. The different values of these two parameters reflect different habits of users and the way of transmission of art information, which will have a negligible impact on the process of dissemination of art information.

Parameter  $\beta$ : As time goes on, the user may see the same art information shared by other friends, and at this time the user will choose not to forward the art information, and the spread of the art information enters a stagnant stage.

Parameter  $\eta$ : In the actual propagation, the node state often changes with time, and it is not static (Zincke, 2014). For an art communication message, the user will be tired of browsing and will become the recovered node. The recovered node is not permanently immune to art communication information. This part of nodes will turn to trust the art information with a certain probability and become an infective node.

## Experimental analysis

### Analysis of the influence of art information values on the development of art communication information

#### *Experimental environment*

The simulation experiment of the S-SEIR art information communication and development model based on social network was carried out using the Simulink in Matlab mathematics tool. Simulink provides a series of basic system modules divided by function, which can be simulated and analyzed by the user through these basic modules and the required system model connected by using the mouse (Liu *et al.*, 2019; Sun; Xu; Jiang, 2019; Zeng *et al.*, 2019; Cao *et al.*, 2020; Sun *et al.*, 2020).

#### *Setting of experimental parameters*

The parameters in the experimental model are set as follows. (1) Node class setting: Set the susceptible node  $S(t)$ , the exposed node  $E(t)$ , the infective node  $I(t)$ , and the recovered node  $R(t)$ . (2) The setting of the initial values of the node: The number of users  $N = 10000$  at  $t = 0$ ,  $S(0) = 9999$ ,  $E(0) = 0$ ,  $I(0) = 1$ , and  $R(0) = 0$ . (3) Initial parameters setting: at  $t = 0$ , the network with  $N = 10000$  is selected for the experiment. Assume that 1/20 nodes are inactive nodes, that is, they are transformed directly from the susceptible state to the recovered state. Then,  $\alpha = 0.05$ . There are 1/4 nodes browsing the art communication information, but not necessarily trusting the information, thus they are transformed from the susceptible state to the exposed state. From the expression of  $\varphi(t)$ , it can be known that  $V_0 = 0.25$  and  $\lambda = 4$ . Assume  $\delta = 0.85$ ,  $\theta = 0.15$ ,  $\beta = 0.5$ , and  $\eta = 0.005$ .

In the experiment, we analyzed the impact of artistic information value on art communication by presenting different initial conditions.

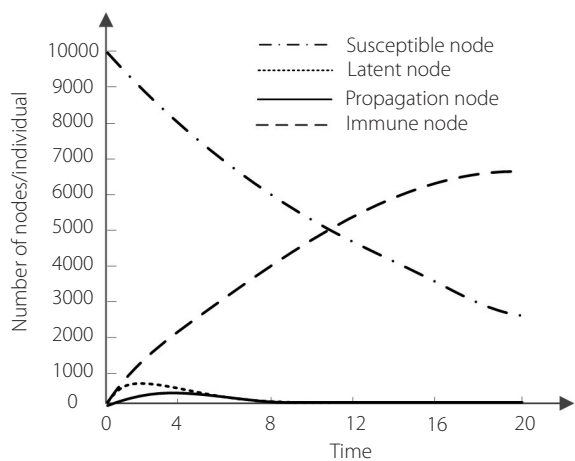
#### *Experimental results and analysis*

In order to research the impact of the value of artistic information on art communication development, a simulation experiment was carried out in Matlab (Chen, 2015). The change of the number of nodes in each communication process is analyzed experimentally with the value of art information. The importance of art information is set to a random number in 0~1. The greater the number, the higher the value of the art information. The five sets of values 0.09, 0.25, 0.41, 0.65, and 0.9 are taken for the value of the art information, respectively. To eliminate other effects, the remaining parameters are set to the initial value.

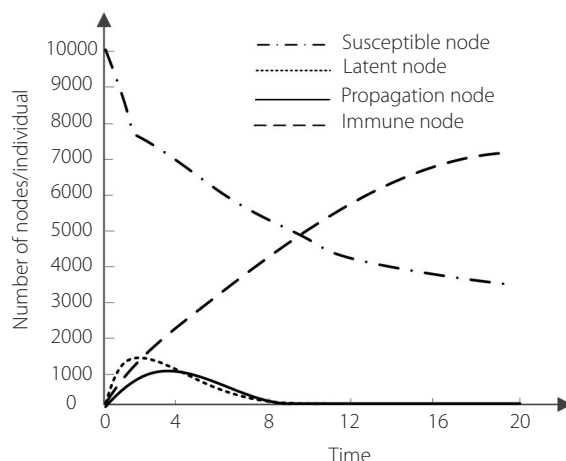
Under different  $V_0$ , the evolution of the susceptible node  $S(t)$ , the exposed node  $E(t)$ , the infective node  $I(t)$ , and the recovered node  $R(t)$  with time is shown in Figure 3. The abscissa is the time variable, and the ordinate is the change of the number of nodes in different states.

In Figure 3, it can be seen that, under different values of  $V_0$ , the number of susceptible nodes decreases rapidly with time and maintains another downward trend in the remaining time. The exposed node initially increases to peak value and then decreases until it reaches 0. The infective node presents an increasing trend in the initial time step. After reaching the peak, as the node loses interest in the art information or the timeliness of the art information, the number of nodes in the information transmission is reduced, and eventually no node is propagating the art information. The number of recovered nodes is growing as time goes on, which indicates that most of the users in the final social network will become immune and not continue to spread the information.

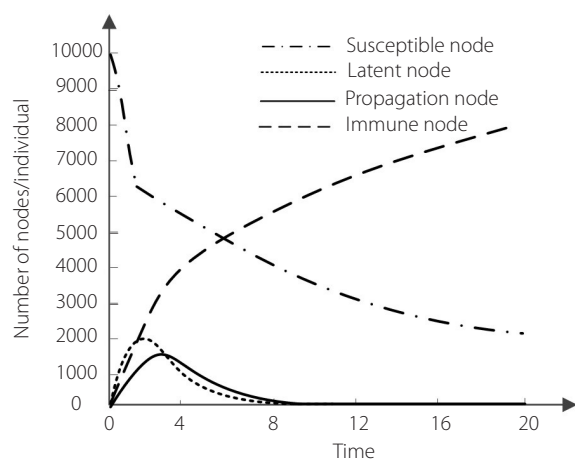




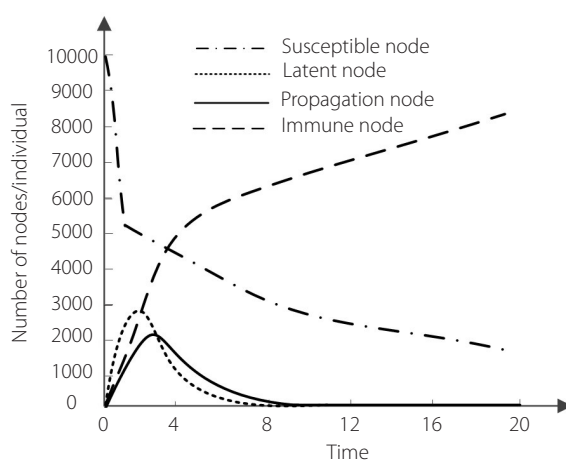
(a) The change in the number of state nodes at  $V_0 = 0.09$



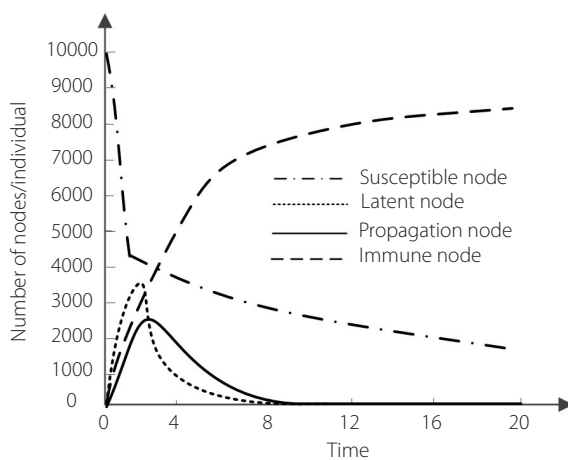
(b) The change in the number of state nodes at  $V_0 = 0.25$



(c) The change in the number of state nodes at  $V_0 = 0.41$



(d) The change in the number of state nodes at  $V_0 = 0.65$



(e) The change in the number of state nodes at  $V_0 = 0.9$

**Figure 3.** Changes in the number of state nodes under different parameter settings.

Source: Elaborated by the authors (2019).

The value of  $V_0$  is increased. In Figure 3(a) ~ Figure 3(e), before the turning point, the larger the value of  $V_0$ , the faster the decline of the curve and the faster the reduction of the susceptible nodes. After the turning point, the greater the value of  $V_0$ , the slower the curve changes, and it gradually tends toward a gentle state with the increase of the value. It shows that when users are not very interested in art information, most users will not be concerned about the art information and continue in the susceptible state. On the contrary, when the value of art information is high, users will find the art information very attractive, so a large number of users will browse the art information in a short time and become exposed nodes. After the turning point, due to its prolonged dissemination, the art information began to be known by some users in the network, who would forward the art information to other friends. The number of nodes in the exposed state, the infective state, and the recovered state will increase with the time, which leads to the decrease of the change speed of the node in the susceptible state, and the trend is more and more obvious as the value of  $V_0$  becomes larger.

The different values of  $V_0$  affect the peak time of  $E(t)$  arrival and affect the peak value of  $E(t)$ . The larger the value of  $V_0$ , the faster the corresponding  $E(t)$  will initially increase, the faster the decline after reaching the peak, and the higher the peak value. The maximum value of  $E(t)$  in Figure 3(a) is about 500, and the maximum value of  $E(t)$  in Figure 3(e) is 3500. It shows that the recognition ability of user nodes to art information is directly related to the spread of art information in the network. The higher the value of art information, the stronger the diffusion of art information in the network.

From Figure 3, it can be seen that, the height of the  $I(t)$  curve in Figure 3(e) is significantly higher than that in the other curves. It shows that the dissemination of art information in the network has a high degree of activity. Because art information is transmitted very fast on the Internet, most of the nodes can obtain the art information in a short time. At the initial stage of art information dissemination, because a large number of nodes receive art information and become the exposed nodes, the number of the infective nodes also increased rapidly. The peak of the infective node occurs when the exposed node reaches the peak value. This is in accordance with the law of the real communication. When the peak value is reached, as the nodes lose interest in the art information, the curve will be attenuated.

The larger the value of  $V_0$ , the higher the trend of the corresponding curve  $R(t)$ . It shows that the increase of the recovered node is faster than for the curves with smaller values of  $V_0$ . In the network, as the curve  $I(t)$  reaches the peak, the infective node loses interest in the art information, leading to the flattening of curve, and finally to reach a stable value. In the network, if the amount of art information is too large, its expansion make some of the users immune or even repugnant to the art information, which causes the number of recovered nodes to increase rapidly because of the user's neglect.

To sum up, when the art information value is low, as shown in Figure 3(a), the propagation of art information in the whole network is in an inactive state. The dissemination of artistic information lags behind. Therefore, pieces of art information will eventually be submerged in the largest amount of art information present. While the value of  $V_0$  continues to increase, the network is gradually active, and the number of nodes in the network is increasing. The number of the susceptible nodes and the infective nodes in the network are also increasing. The increase of the number of nodes in these states indicates that art information begins to be transmitted frequently in the network.

The experimental results show that, when other parameters remain unchanged, the art information attraction function determined by the value of that information affects its dissemination. Within a certain range, the transmission rate of art information is positively related to its value. The higher the value of the art information, therefore, the more nodes in the exposed state of the network, the more conducive to the dissemination of art information, and the earlier the infective nodes reach the peak, that is, the shorter the time it takes to spread the art information.

The effect of the user behavior parameters  $\delta$  and  $\theta$  on the art information communication and development is experimented with Matlab (Chen, 2015). Experimental results show that the dissemination of art information in the network depends on the participation of users. It has a great relationship with the attitude and behavior of users to treat art information.  $\delta$  represents the probability that the exposed node transforms into the infective node, and  $\theta$  represents the probability that the exposed node transforms into the recovered node. Different combinations of  $\delta$  and  $\theta$  represent the art information processing or behavior preference of the node. More nodes in the network are transformed into the infective nodes to promote the dissemination of art information. The number of the infective nodes continues to increase, reaching a peak value, and also attenuates at a faster rate. That is, the speed of extinction of art information is faster. The effect of  $\theta$  on the number of state nodes is the opposite of  $\delta$ . Therefore, the value of  $\theta$  and  $\delta$  can affect the following two aspects in the process of the dissemination of art information: first, the scale of information dissemination, and second, the speed of the final extinction of the art information. Therefore,  $\theta$  and  $\delta$  are very important parameters in the process of artistic information dissemination. To propagate art information in social networks, we must master the relationship between these two parameters correctly and improve the dissemination effect of art information.

### Performance analysis of the proposed model

It can be seen from the experimental analysis and results that this model can effectively analyze the communication and development of artistic information under the influence of social networks. In order to verify the performance advantages of the proposed model, this model, art information communication model based on trust, and art information communication model based on nodes, as well as their information characteristics, are respectively used for comparative experiments. Three models were used to predict the propagation effect of different types of information in social networks, and the predicted users were compared with the actual statistical users (Table 1).

**Table 1.** Comparison between the predicted users and the actual value of different models.

Model	This article's model / person	Art information dissemination model based on trust degree/ person	Propagation model of art information based on node and information characteristics / person	Actual value / person
Literary information	712	504	456	864
Campus information	942	846	820	1035
Scientific and technological information	246	205	166	278
Dating information	435	385	257	458
Game information	1750	1430	1620	1870
Art information	1450	1290	1059	1460

Note: The results are expressed in numbers.

Source: Elaborated by the authors (2019).

In Figure 1, it can be seen that the number of users predicted by the proposed model is closest to the actual value and the accuracy is thus higher. This model is particularly outstanding in predicting the number of users of art information. The actual number of users is 1460. The prediction result of the proposed model is 1450, with the accuracy rate of 99%. In the prediction of the effect of art information communication, the accuracy rate of the trust-based art information communication model and the art information communication model based on the characteristics of the node and information is 88% and 72% respectively, far below the proposed model's one.

In order to verify the prediction efficiency of the proposed model, ten comparison experiments were carried out by using three models, and the time consumption of the three models for prediction of the communication effect of the art information was recorded (Table 2).

**Table 2.** Comparison of the time of consumption of art information dissemination effect predicted by different models.

Sequence number of simulation experiment	This article's model /s (n)	Art information dissemination model based on trust degree/s (n)	Propagation model of art information based on node and information characteristics/s (n)
1	125	205	304
2	116	228	356
3	103	245	305
4	102	226	315
5	106	215	323
6	115	238	325
7	105	259	327
8	129	256	328
9	118	246	319
10	103	216	309
Average value	112.2	233.4	321.1

Note: The results are expressed in numbers.

Source: Elaborated by the authors (2019).

From Table 2, it can be seen that in ten simulation tests, the average time consumption of the trust-based art information communication model is 233.4s, the highest is 259s, and the lowest is 205s. The average time consumption of the art information communication model based on the node and the information characteristics is 321.1s, the highest is 356s, and the lowest is 304s. The average time consumption of the proposed model is 112.2s, the highest is 129s, and the lowest is 102s. The comparison results show that the time consumption of the proposed model is the shortest for prediction of the communication effect of the art information. It has an efficient advantage and obtains accurate results of the prediction of art information communication.

## Conclusion

In order to promote the active communication and development of art information under the influence of social network, this paper designed a social network art communication development model based on S-SEIR. Combined with the concept and characteristics of art communication, on the basis of SEIR classic epidemic dynamics model, the value of art information and user behavior factors were considered. The S-SEIR art communication and development model based on social network was proposed. The evolution rules of node classification and art information were obtained, and the S-SEIR art communication and development model based on social network was designed. The experimental results show that the model can clearly analyze the impact of art value and user behavior on the dissemination and development of art information. It has the advantages of high efficiency, accuracy, and high application value.

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## Contributors

D. ZHANG participated in the research conception and design, experiments, and manuscript writing. D. SUN participated in data analysis and interpretation, experiments, and manuscript writing.

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