Computing and Informatics, Vol. 42, 2023, 1114–1135, doi: 10.31577/cai_2023_5_1114

PUBLIC OPINION MONITORING AND GUIDANCE ANALYSIS IN THE PROCESS OF NEWS DISSEMINATION FROM THE PERSPECTIVE OF BIG DATA

Wei Shi*, Weiwei Qin

School of Humanities and Law, NanChang HangKong University
NanChang, 330063, China
e-mail: shiweiniat@126.com

Abstract. In order to improve the positive effect of news communication, this paper conducts research on the detection and analysis of public opinion in the process of news communication from the perspective of big data and analyzes the guidance of news communication public opinion. Combined with the actual needs of news dissemination, the numerical accuracy, convergence order, numerical convergence and numerical stability of the SS-CSPH method are mainly analyzed and discussed according to the results of numerical simulation. Moreover, this paper confirms that the smooth function and smooth length do have an impact on the solution of the Strang split-corrected smoothed particle hydrodynamics method (SS-CSPH). In addition, this paper constructs a public opinion monitoring and guidance system in the process of news dissemination. From the simulation evaluation results, it can be seen that the method of public opinion detection and guidance in the process of news dissemination proposed in this paper can play a certain role in the monitoring and guidance of news public opinion.

Keywords: Big data, news dissemination, public opinion monitoring, public opinion guidance

* Corresponding author

1 INTRODUCTION

Inversion news phenomenon is a news phenomenon unique to the rich media era based on the background of Internet technology. The news content is mainly based on social and people's livelihood. As the reporting process goes on, the truth of the core event becomes clearer and clearer, and audience participation and changes in public opinion become part of the news. The phenomenon of reverse news contains an element of distortion, but it is not deliberately fabricated. Reverse news is completely different from fake news. Since the latter has no factual basis or distorts the facts by fiction, its core is false, although it contains factual statements and some detailed descriptions [1]. At the same time, the concept of false news is also different from fake news, which is a "one-sided" or "fragmented" report on a certain news event to be reported. It is factually based, but is not comprehensive and accurate, with the reporter's personal bias and subjective interpretation. According to the simple explanation of the above two concepts, we can actually feel it intuitively: the reports in the "reversed news phenomenon" are not fabricated by journalists [2].

The facts are objective. Due to the reporter's observation angle and thinking set, the report temporarily deviated from the truth of the event. Through the process of amendment and supplementation, the truth of the event is finally presented. Therefore, the "reverse news phenomenon" should not be characterized as "false news" or defined as "false news". The fact distortion in the reverse news phenomenon may be just a temporary blind spot of the journalists' own observation and cognition, and its fundamental connotation is deeper and wider than "false news". Strictly speaking, false news cannot be called "news" in essence, it is more similar to "novels", while false news is news in essence [3]. The phenomenon of reverse journalism includes many processes. From the beginning of the news report to the end, the truth of the whole event is released to the public. It is not only the fact that the news is not true at the beginning of the news report. In fact, in the history of journalism, it is not difficult to find the phenomenon of reverse journalism, but the past is more like a random imagination [4]. With the rapid development of information technology, the phenomenon of reverse journalism is emerging endlessly, and the trend of news normalization is gradually emerging. So, we have to be vigilant. When an accidental phenomenon in the past has become a high-incidence phenomenon now, do we need to examine whether there are problems in today's entire news industry environment and start some targeted research [5]. In the traditional era, the news production mode and technology are relatively simple, and they are often only spread through newspapers and television. At the same time, the production mode of traditional news pays more attention to the authority of its information, and the risk control process is relatively strict. Only through layer-by-layer review can a news information be released, and the manufacturing cycle of news information will be longer [6]. In the new media era, the traditional production mode has been gradually replaced. At present, the news production mode around the network media occupies the C position. An ordinary journalist may only need a few seconds to produce piece of news that is seen by the world. Technological progress has changed the mode of

news communication, and all journalists have stood on the same running line. The news channel is no longer an important factor, and everyone has started to compete for the news itself [7]. The purpose of efficient and streamlined production is to enhance the competitive advantage of the timeliness of news. The rapid and large-scale production has greatly reduced various costs, and the linear decline in costs has led to an exponential increase in quantity. The audience has passively entered an era of information explosion, and the difficulty of selecting effective information has also risen sharply [8].

The advantage of traditional media in the past is content control, but this has become an obstacle to progress in the new media era, and the timeliness can not catch up with the emerging media. So, we can see that most of the news is usually first published in the online media, and then the traditional media begins to follow up. Therefore, in today's media ecology, traditional media, and emerging media account for half of the country, respectively. Only by learning from each other, can traditional media and new media jointly create a healthy and orderly communication environment [9]. Today, the media industry will report news content selectively for its own interests. The reasons for the emergence of selective reporting may exist in several aspects: first, selective reporting is not a derogatory term, it is produced with the emergence of news, and it can even be said that it is the normal situation in news reporting, because there are many news events in the world at any time. If media workers do not screen and distinguish from a professional perspective, this itself is unrealistic. One of the responsibilities of the media is to screen and control information. Therefore, it is the responsibility of the media to select appropriate news for interview and reporting [10]. In today's mixed media ecological environment, media people, on the one hand, play the role of event mouthpiece, on the other hand, play the role of social magnifying glass. Some media people carry out news reporting with coloured glasses and news manufacturing with their own prejudices. Unilateral reporting will do harm to the media industry and society to varying degrees and affect the entire ecological environment [11].

The new media era has subverted the original news communication model. Traditional media have become profitable enterprises, and their market competitiveness is facing challenges. News in the new media era has the characteristics of timeliness and fragmentation. News reports are more focused on real-time reporting, which involves the need to verify news information. Nowadays, the competitive pressure of the news media environment leads to the release of news information without verification. At the same time, some media tend to use seditious headlines or words to mislead the public to pay attention to this news event in order to win users' attention at the first time and gain greater exposure. In such an era of excess information, news materials are never lacking. What is lacking is the short attention of the receiver. Therefore, the first news release that can cause topics has become the key to victory. Among media platforms, news practitioners learned first-hand new news through their own channels, edited, collated and disseminated it in the fastest time, and fermented and disseminated the released news through some grey means, such as "water army", so as to trigger the recipients' forwarding and comments [12].

If the above cannot be achieved, real-time follow-up reporting is also a way to "brush the sense of existence". At the same time, due to various realistic conditions, not all media can interview and confirm the reported events, so journalists will use the comments of netizens as the basis, and their own understanding of the events, so as to have more subjective imagination and description.

The progress of communication technology is changing the way people communicate. The rapid innovation of technology opens a "door to a new world" for people. People can interact directly and in real-time, not limited by regions and borders. In addition, the progress of media technology makes it possible to have a consistent cognition of time in different spaces. Communication between receivers and the original mass communication becomes blurred. Recipients have huge initiative, and the status of past communicators has been weakened. Such a convenient way to obtain information has gradually formed a shortcut like "live broadcast" in people's cognition. Some media and individuals will deliberately magnify a detail or deliberately create false details to achieve their own special purpose [13].

From the perspective of the era of news media transition, in the era of news dissemination, the production and operation process of news is relatively standardized and strict. Reporters themselves have full responsibility and time to verify the source of information, and editorial departments also need to check the accuracy of information. It can be said that such a set of operation processes has greatly reduced the error rate of news releases. However, with the continuous development of information technology, under the influence of today's network communication environment, although traditional media institutions still dominate the development of the overall press, the common influence of diversified communication subjects in the era of financial media has promoted the complexity and variability of network communication in the new media era [14].

From the perspective of big data, this paper conducts research on the detection an analysis of public opinion in the process of news communication, and analyzes the guidance of public opinion in news communication, to improve the positive development of social public opinion.

2 FEATURE RECOGNITION OF NEWS AND PUBLIC OPINION INFORMATION FRAMES

2.1 Split Modified SPH Method for Nonlinear Schrödinger Equation

The research objects considered are mainly the following nonlinear Schrödinger equations without angular momentum rotation terms:

$$i\psi_t(\mathrm{x},t)+\alpha(t)\Delta\psi+V(\mathrm{x},t)\psi+\beta(t)|\psi|^2\psi=0,\quad \mathrm{x}\in \mathrm{i}^d, t\geq 0. \tag{1}$$

Among them, Δ is the Laplace operator, $i=\sqrt{-1}$ is the complex unit, t is the time variable, x the space vector, $\psi(\mathrm{x},t)$ is the complex-valued wave function, $\alpha(t)$ is related to the dispersion efficient, $V(\mathrm{x}, t)$ is the external potential, and $\beta(t)$ is the

nonlinear coefficient. First, we quote the idea of split format to write Equation (1) in the following form:

$$i\frac{\partial}{\partial t}\psi(\mathrm{x},t)=(A+B)\psi(\mathrm{x},t),\mathrm{x}\in \mathrm{i}^{d} \tag{2}$$

Among them, $A=-\alpha(t)\Delta$ represents a linear operator, and $B=-V(\mathrm{x},t)-\beta(t)|\psi|^{2}$ represents a nonlinear operator. Then the linear part Equation (3) and the nonlinear part Equation (4) can be solved separately.

For the solution of Equation (4), the conjugate $\overline{\psi(\mathrm{x},t)}$ of $\psi(\mathrm{x},t)$ can be multiplied at both ends getting the following:

$$i\frac{\partial}{\partial t}|\psi(\mathrm{x},t)=A\psi(\mathrm{x},t)=-\alpha(t)\triangle\psi(\mathrm{x},t), \tag{3}$$

$$i\frac{\partial}{\partial t}|\psi(\mathrm{x},t)=B\psi(X,t)=-V(\mathrm{x},t)|\psi(\mathrm{x},t)-\beta(t)|\psi(\mathrm{x},t)|^{2}\psi(x,t). \tag{4}$$

By conjugating both ends of Equation (5), we get:

$$i\frac{\partial}{\partial t}|\psi(\mathrm{x},t)|^{2}=-V(\mathrm{x},t)|\psi(\mathrm{x},t)|^{2}-\beta(t)|\psi(\mathrm{x},t)|^{4}, \tag{5}$$

$$\frac{\partial}{\partial t}|\psi(\mathrm{x},t)|^{2}=0. \tag{6}$$

If $\rho(\mathrm{x},t)=\psi(\mathrm{x},t)|^{2}$, it can be obtained from (6):

$$\rho(\mathrm{x},t)=\psi(\mathrm{x},t)|^{2}\equiv|\psi\left(\mathrm{x},t_{n}\right)|^{2}=\rho\left(t_{n},\mathrm{x}\right),t\geq t_{n}. \tag{7}$$

Substituting Equation (7) into Equation (4), we can get:

$$i\frac{\partial}{\partial t}\psi(\mathrm{x},t)=-V(\mathrm{x},t)\psi(\mathrm{x},t)-\beta(t)\left|\psi\left(\mathrm{x},t_{n}\right)\right|^{2}\psi(\mathrm{x},t),t>t_{n}. \tag{8}$$

Equation (8) can be solved directly, and its true solution can be obtained as:

$$\psi(\mathrm{x},t)=e^{i\left(V(x,t)+\rho(t)\psi(x,t_{n})^{2}\right)(t-t_{n})}\psi\left(\mathrm{x},t_{n}\right),t\geq t_{n}. \tag{9}$$

In actual calculation, from time $t=t_{n}$ to time $t=t_{n+1}$ can usually be calculated by applying the idea of Strang splitting scheme, that is, we can decompose the problem into the following three subproblems to solve:

$$i\frac{\partial}{\partial t}\psi(\mathrm{x},t)=-V(\mathrm{x},t)\psi(\mathrm{x},t)-\beta(t)|\psi(\mathrm{x},t)|^{2}\psi(\mathrm{x},t) \tag{10}$$

$$i\frac{\partial}{\partial t}\psi(\mathrm{x},t)=-\alpha(t)\Delta\psi(\mathrm{x},t) \tag{11}$$

$$i\frac{\partial}{\partial t}\psi(\mathrm{x},t)=-V(\mathrm{x},t)\psi(\mathrm{x},t)-\beta(t)|\psi(\mathrm{x},t)|^{2}\psi(\mathrm{x},t) \tag{12}$$

The Strang splitting scheme is second-order accurate and unconditionally stable in the time direction. According to the previous analysis, we can directly obtain the true solutions for the above (10) and (12). For formula (11), the first order symmetric smoothed particle hydrodynamics (SPH) method can be used to solve it. Finally, the following discrete model can be obtained:

$$\psi^{*\mathrm{j}} = e^{i(V(x_j^a,t_n)+\beta(t_n)|\psi_j^n|^2)\triangle t/2}\psi_j^n, \tag{13}$$

$$(q)_j^a = \sum_n \frac{1}{np_k}(\psi_k^* - \psi *_j)\frac{\partial^s W_j k}{\partial X_j^a}, \tag{14}$$

$$\frac{\partial \psi^* *_J}{\partial t} = a(t_n)\sum_k \frac{1}{np_k}(q_k^a - q_j^a)\frac{\partial^s W_j k}{\partial x_j^a}, \tag{15}$$

$$\psi_j^{n+1} = e^{i(V(x_j^a,t_n)+\beta(t_n)|w_j^*|2)\triangle t/2}\psi_j^{**}. \tag{16}$$

Among them, x_j^α represents the α^{th} component of the j^{th} spatial news public opinion information frame, np_k represents the density number corresponding to the k^{th} news public opinion information frame, $\frac{\partial^S W_{jk}}{\partial \mathrm{x}_j^a} = (\mathrm{A}^s)^{-1}\begin{pmatrix}(x_k - x_j)W_j\\(y_k - y_j)W_j\\\mathrm{M}\end{pmatrix}$ represents the corrected kernel gradient, where $\mathrm{A}^S = \left[A_{a\rho}^S\right], A_{a,\rho}^S = \sum_k \frac{1}{np_k}\left(\mathrm{x}_k^\alpha - \mathrm{x}_j^a\right)\left(\mathrm{x}_k^\rho - \mathrm{x}_j^\rho\right)W_{jk}, W_{jk} = W\left(|\mathrm{x}_j - \mathrm{x}_k|, h\right)$ represents the smooth function, h represents the smooth length.

The split correction smoothed particle hydrodynamics (SPH) method is used to solve Equations (10), (11) and (12). When the time step is from t_n to t_{n+1}, the algorithm process for solving the numerical solution ψ_j^{n+1} at the position of space x_j is as follows:

Algorithm 1. The split-modified smoothed particle hydrodynamics (SPH) method algorithm for solving the nonlinear Schrödinger equation is as follows:

1. The algorithm takes ψ_j^n as the initial value, and obtains ψ_j^* by solving Equation (10) as follows:
2. The algorithm takes ψ_j^* as the initial value, and uses Equations (18), (19) and (3) to solve Equation (11) to obtain $\psi_j^{\#*}$:

$$\psi_j^{n+1} = e^{\left\{\left(T(x_{t_n}t_n)+\mu(t_n)\psi_j|'\right)dt/2\right.}\psi_j^{**}.$$

2.2 Numerical Simulation of Nonlinear Schrödinger Equation

The performance of the split correction smoothed particle hydrodynamics (SPH) method in numerical accuracy, numerical convergence and numerical stability under different news and public opinion information frame distributions is studied through six different examples. In order to make the numerical simulation results typical, the

examples with true solutions and the examples without true solutions are selected respectively. The numerical solution obtained by the split finite difference method is compared with the numerical solution of the split modified smoothed particle hydrodynamics (SPH) method to verify the validity and reliability of the split modified smoothed particle hydrodynamics (SPH) method for examples without true solutions.

This section mainly selects the linked list search method to search the news and public opinion information frames in the support domain.

Example 1. Equation (1) takes $\alpha(t) = 1, \beta(t) = 2, V(\mathrm{x}, t) = 0$, namely

$$i\frac{\partial \psi}{\partial t} + \psi_{xx} + 2|\psi|^2\psi = 0, x \in [-20, 20]. \tag{17}$$

The true solution of this equation is:

$$\psi(x,t) = \operatorname{sech}(x - 4t)\exp[i(2x - 3t)].$$

First, we define the following convergence order formula:

$$\text{order} = \log\left(\frac{\text{Error 2}}{\text{Error 1}}\right) / \left(\log\left(\frac{h_2}{h_l}\right)\right). \tag{18}$$

For this example, the quintic spline smooth function is selected for numerical simulation, and the smooth length is selected to represent the frame interval of the initial news public opinion information, and the time step dt = 0.0001 is taken. In the case of uniform distribution of news and public opinion information frames, for example 1, the Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) method can achieve second-order accuracy. In fact, it can be seen that the spatial error and convergence speed of the SS-CSPH method depend on h and $\Delta x/h$, and if $\Delta x/h$ is too large or too small, the numerical format may not converge. Only when the distribution of news and public opinion information frames are uniform and $\Delta x/h$ is a suitable constant, the error order of the discrete format is exactly $O(h^2)$, that is, the corresponding convergence order is 2. In addition, the choice of examples also affects the numerical accuracy of the Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) method in the process of numerical simulation.

Example 2. Equation (1) takes $\alpha(t) = \frac{1}{2}\cos(t), \beta(t) = \frac{\cos(t)}{\sin(t)+3}, V(\mathrm{x}, t) = 0$, namely

$$i\frac{\partial \psi}{\partial t} + \frac{1}{2}\cos(t)\psi_{xx} + \frac{\cos(t)}{\sin(t)+3}|\psi|^2\psi = 0, x \in [-2, 2]. \tag{19}$$

The true solution of this equation is:

$$\psi(x,t) = \frac{1}{\sqrt{\sin(t)+3}}\operatorname{sech}\left(\frac{x}{\sin(t)+3}\right)\exp\left(\frac{i\,(x^2-1)}{2(\sin(t)+3)}\right).$$

In the simulation, for the uniform distribution of news and public opinion information frames, 81 news and public opinion information frames are taken, the corresponding news and public opinion information frame spacing and the time step is dt = 0.0001. For the uneven distribution of news and public opinion information frames, 81 news and public opinion information frames are taken, and the time step of the corresponding news and public opinion information frame spacing distribution is dt = 0.0001.

For the case of uniform distribution, we take the smooth length $h = d_0$. However, for the nonuniform distribution of news and public opinion information frames, we take the smooth length $h_0 = d_0, h_i = (d_{i-1} + d_i)/2\ (0 < i < N-1), h_{N-1} = d_{N-2}$. Among them, h_i represents the smooth length corresponding to the i^{th} news public opinion information frame, d_i represents the i^{th} news public opinion information frame spacing, and N represents the number of news public opinion information frames. This study will use the quintic spline smoothing function for numerical simulation.

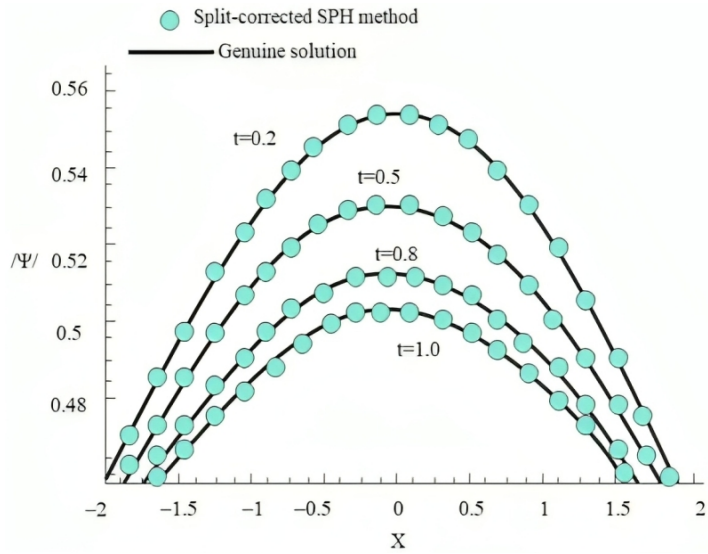


Figure 1. Comparison curve between the numerical solution and the real solution at different times when the distribution of news and public opinion information frames is nonuniform

Figure 1 shows the comparison curves of the numerical solution and the true solution at several different times when the SS-CSPH method has uneven distribution of news and public opinion information frames. It can be seen that in the case of uneven distribution of news and public opinion information frames, the numerical solution obtained by SS-CSPH is in good agreement with the real solution. When the news and public opinion information frames are evenly distributed, the numer-

ical simulation of this example by the SS-CSPH method does not always converge to the second order. In fact, in the process of actually solving the problem, the accuracy, stability and convergence of the SS-CSPH method are often affected by the coefficients of the example, the solution area, as well as the kernel function, the smooth length, and the position of the news and public opinion information frame. Therefore, the theoretical convergence analysis cannot be applied to all cases.

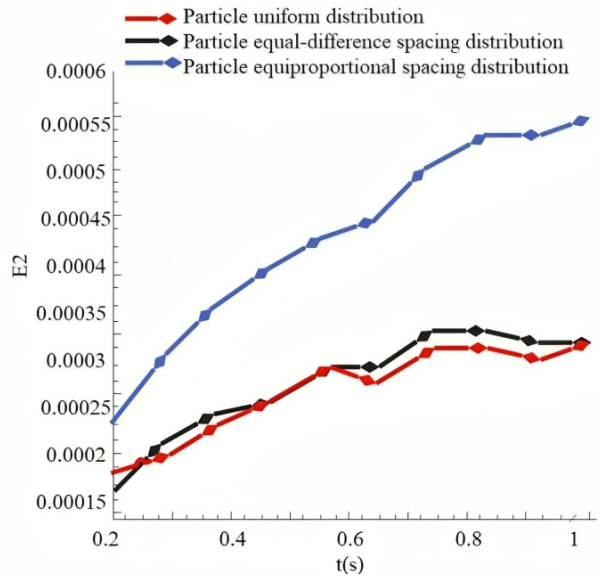


Figure 2. Comparison of the 2-norm error between the numerical solution and the true solution over time under three different news and public opinion information frame distributions

Figure 2 shows the comparison of the 2-norm error between the numerical solution and the true solution at different times when the news and public opinion information frames are uniformly distributed, the news and public opinion information frames are equally spaced, and the news and public opinion information frames are equally spaced. Among them, the 2-norm error is $E_2 = \sqrt{\sum_{i=1}^{N} (\psi_{s,i} - \psi_{a,i})^2} / \sqrt{\sum_{i=1}^{N} \psi_{a,i}^2}$, where $\psi_{s,i}, \psi_{a,i}$ is the numerical solution and the true solution, respectively. It can be seen from Figure 2 that the 2-norm error in the case of non-uniform distribution of news public opinion information frames (equidistant spacing distribution and equal spacing distribution) can achieve the same accuracy as the 2-norm error of uniform distribution of news public opinion information frames. This just shows that the Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) method has a good effect on the nonuniform distribution of news and public opinion information frames. In the above analysis, we use the quintic spline smooth function, and the selection of the smooth function affects the accuracy and stability

of the numerical solution of the smoothed particle hydrodynamics (SPH) method. Therefore, based on this equation, we will study the effect of the smooth function in the numerical simulation of the Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) method when the news public opinion information frames are uniformly distributed and the news public opinion information frames are not uniformly distributed.

It can be seen from Figure 3 that no matter whether the distribution of news public opinion information frames is uniform or not, the error between the numerical solution obtained by using the cubic spline smooth function and the true solution is the smallest. That is, the cubic spline smooth function has the highest accuracy for the numerical solution of Strang split-corrected smoothed particle hydrodynamics (SS-CSPH). However, for the quintic spline smooth function and Gaussian smooth function, the accuracy of the quintic spline smooth function is slightly better than that of the Gaussian smooth function. The absolute error between the numerical solution and the true solution at the time $t = 1$ using three different kernel functions is shown in Figure 4 when the news and public opinion information frames are evenly distributed.

Considering Equation (19), the solution area is $[20, -20]$, the number of news and public opinion information frames are 801, and the time step is unchanged. Figure 5 shows the absolute error between the numerical solution and the true solution using three different kernel functions at the time $t = 1$ under the condition of uniform distribution of news and public opinion information frames. It can be seen that the distribution law of the absolute error value is roughly the same, and there are large oscillations at both ends of the solution area, and the oscillation area of the cubic spline smooth function is the largest, that is, the stability of the cubic spline smooth function is poor.

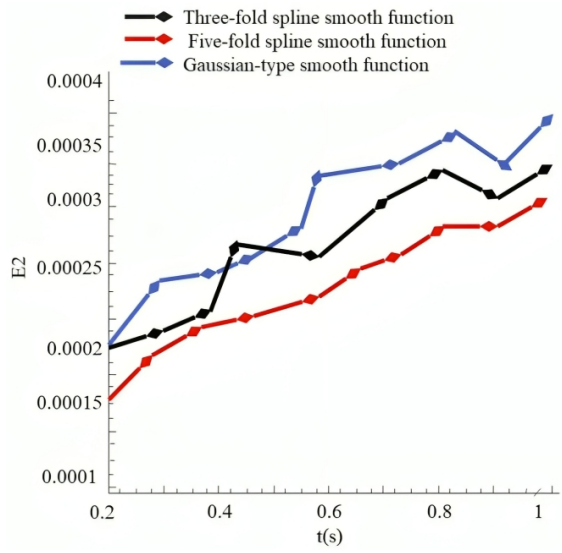
We take the smoothing length $h = d_0$. Figures 5a), b) and c) show the variation of the 2-norm error of the three smoothing functions with different smoothing lengths when the news and public opinion information frames are uniformly distributed. It can be seen that the smoothing length has a significant effect on the effect of the smoothing function in the numerical simulation. For different smooth functions, a certain smooth length can be selected to achieve the best effect in numerical simulation. Conversely, for a fixed smooth length, a smooth function can also be selected to achieve the best effect in numerical simulation.

Example 3. Equation (1) takes $\alpha(t) = \frac{1}{2}, \beta(t) = 1, V(\mathrm{x}, t) = -x\sin(t)$, namely

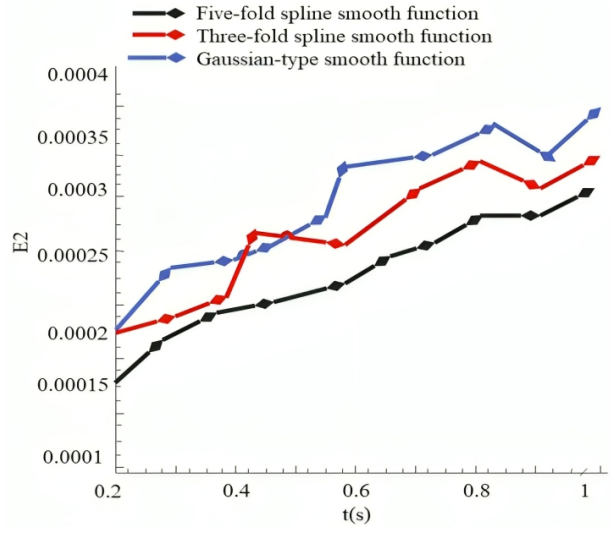
$$i\frac{\partial \psi}{\partial t} + \frac{1}{2}\frac{\partial^2 \psi}{\partial x^2} + |\psi|^2\psi - x\sin(t)\psi = 0, x \in [-20, 20]. \tag{20}$$

The true solution of this equation is:

$$\psi(x,t) = -\frac{3 - 4x^2 + 8x\sin(t) - 4\sin^2(t) - 4t^2 + 8it}{1 + 4x^2 - 8x\sin(t) + 4\sin^2(t) + 4t^2} \times e^{-(i/4)[-4x\cos(t)+\cos(t)\sin(t)-3t]}.$$



a) The comparison chart of the 2-norm error of the numerical solution and the true solution using three different kernel functions under the condition of uniform distribution of news and public opinion information frames over time



b) The comparison chart of the 2-norm error of the numerical solution using three different kernel functions and the true solution under the uneven distribution of news and public opinion information frames with time

Figure 3. Comparison of numerical solutions and true solutions using three different kernel functions

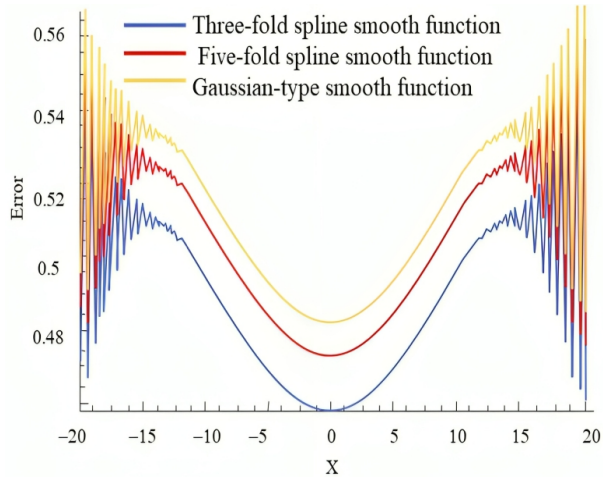
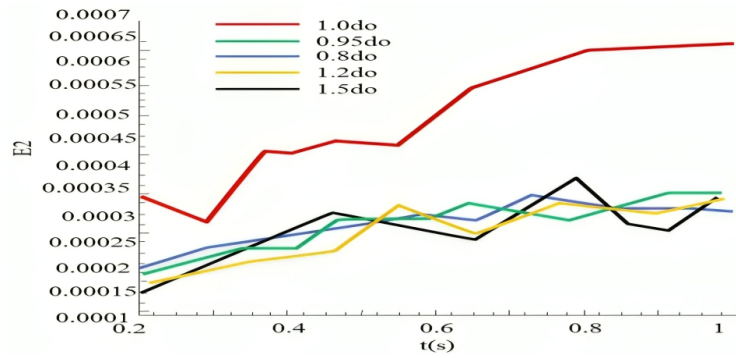


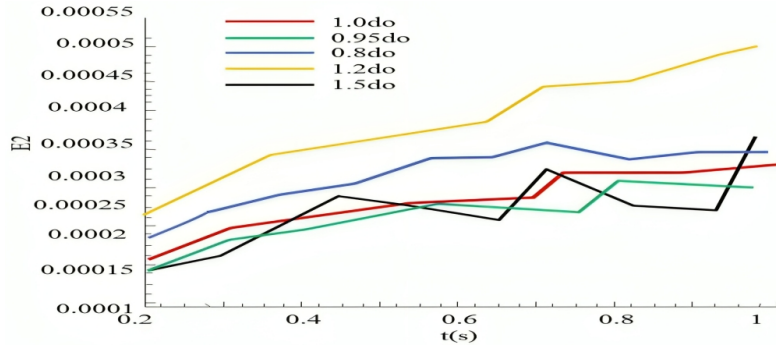
Figure 4. Comparison of absolute errors between the numerical solution and the true solution using three different kernel functions at the time of $t = 1$ under the condition of uniform distribution of news and public opinion information frames

In the numerical simulation, we take 801 news and public opinion information frames in the solution area, the corresponding space step is 0.05, and the time step is dt = 0.0001. The quintic spline smoothing function is selected, and the corresponding smoothing length $h = d_0$ is selected. Figure 6 a) shows the distribution of the absolute error between the numerical solution and the true solution obtained by applying the Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) method to Equation (3) at different positions in the solution area at different times. It can be seen from this figure that the absolute error curve has a larger slope near the center of the solution area. In this case, the local encryption of the news and public opinion information frame can generally be used to reduce the slope of the error curve. Local encryption is performed in the range of $[0, 2]$ in this area, the space step size of the area without encryption is 0.05, and the space step size of the encrypted area is 0.025. Figure 6 b) shows the effect of local encryption through the comparison of 2-norm error curves. From this figure, it can be seen that local encryption has a better effect on reducing errors. Then, in the process of numerical solution using the Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) method, if you encounter a place with a large slope of the error curve (indicating that the error in this area is relatively large), the local encryption method can be used to reduce the error in this area, so as to achieve the effect of reducing the overall error.

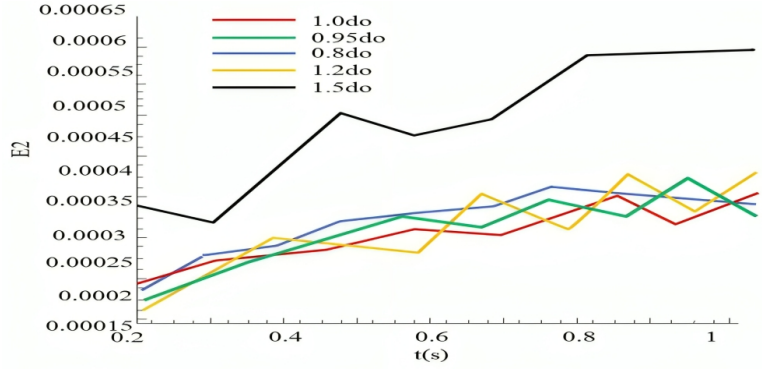
Equation (21) has no true solution, so the numerical results of Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) are mainly compared with the results of the split finite difference method (SSFD) to verify the effectiveness of the Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) method. The quintic spline smoothing function is selected, and the corresponding smoothing



a) Five-fold spline smooth function

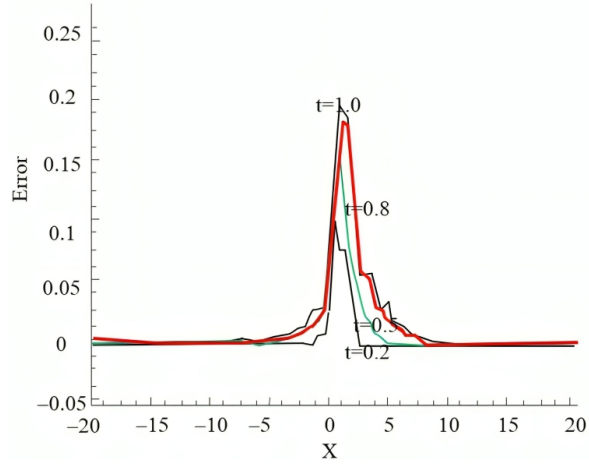


b) Three-fold spline smooth function

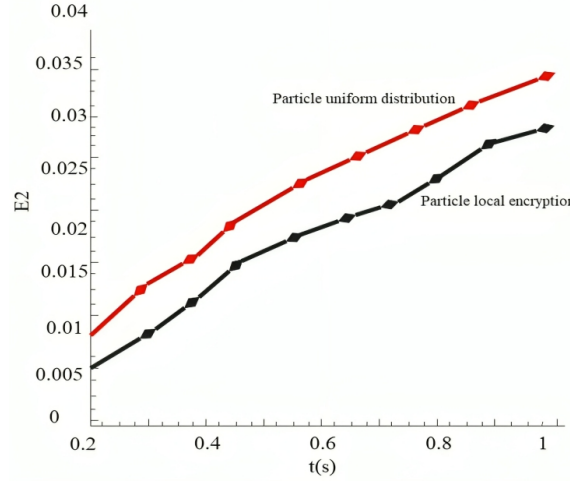


c) Gaussian-type smooth function

Figure 5. The comparison curve of the 2-norm error of the numerical solution obtained by the smooth function for different smooth lengths and the true solution in the case of uniform distribution of news and public opinion information frames in the numerical simulation



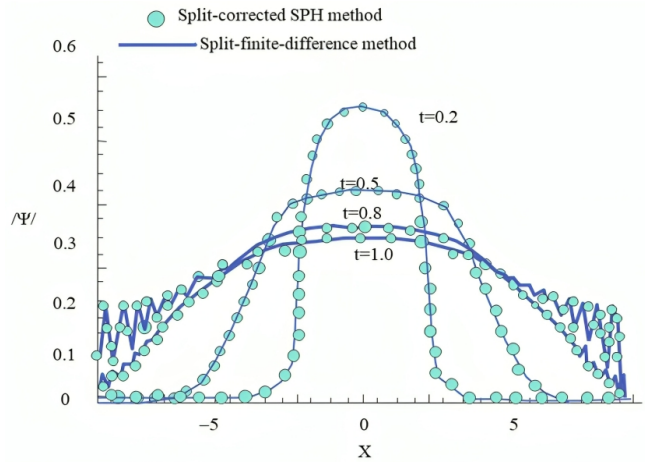
a) The distribution curve of the absolute error between the numerical solution and the true solution at different times



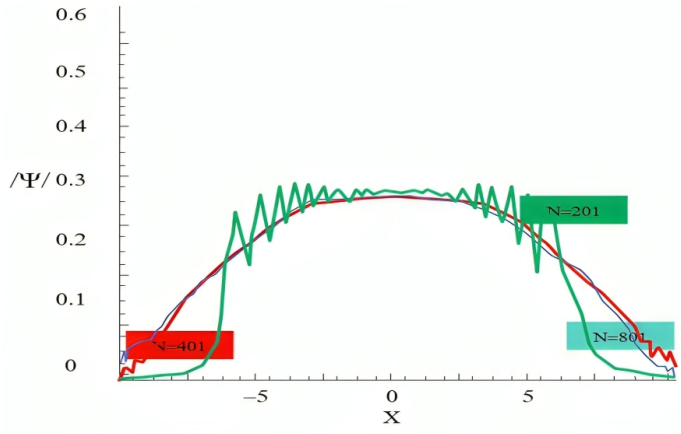
b) Comparison diagram of the 2-norm error of the numerical solution to the true solution before and after local encryption over time

Figure 6. Absolute error between the numerical solution and the true solution

length $h = d_0$ is selected. It can be known from Example 3 that local encryption can reduce the error of the numerical solution to the real solution. Through the Example 4, the influence of the gradual global encryption of news and public opinion information frames on the numerical accuracy of the Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) method will be studied, that is, the numerical convergence of the Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) method will be studied.



a) Comparison curves of the numerical solutions of the two numerical methods at different times



b) Numerical solution curve of SS-CSPH method under different frame numbers of news and public opinion information at time $t = 0.8$

Figure 7. Comparison curves of numerical solutions at different times

It can be seen from Figure 7 a) that the numerical solution obtained by Strang split-corrected smoothed particle hydrodynamics (SS-CSPH) is basically consistent with the numerical solution obtained by SSFD, and the corresponding spatial steps of the SS-CSPH method and the SSFD method are both 0.02. However, the time step corresponding to the SS-CSPH method is 0.0001, and the time step corresponding to the SSFD method is 0.001. According to the distribution of the numerical solution curves of different news and public opinion information frames (different spatial steps) in Figure 7 b), it can be known that the numerical solution of SS-CSPH gradually approaches a fixed numerical solution curve with the global gradual encryption of the spatial news public opinion information frame. That is, the numerical solution obtained by the SS-CSPH method satisfies numerical convergence and numerical stability. Schrödinger equation of $\alpha(t) = \frac{t}{2}$, $\beta(t) = -\frac{t}{2}$, $V(x,t) = 0$ (two-dimensional coupled variable coefficient nonlinear Schrödinger equation), namely:

$$\begin{cases} i\psi_t + \frac{t}{2}\left[\psi_{xx} + \psi_{yy}\right] - \frac{t}{2}\left(|\psi|^2 + |\phi|^2\right)\psi = 0, \\ i\phi_t + \frac{t}{2}\left[\phi_{xx} + \phi_{yy}\right] - \frac{t}{2}\left(|\psi|^2 + |\phi|^2\right)\phi = 0. \end{cases} \tag{21}$$

The true solution of this equation is:

$$\begin{cases} \psi = \dfrac{(1+i)e^{-t^2}\left(1+e^{x+\sqrt{5}y+\frac{\sqrt{3}}{2}t^2+\frac{2\pi}{3}i}\right)}{1+e^{x+\sqrt{5}y+\frac{\sqrt{3}}{2}t^2}}, \\ \phi = \dfrac{(1+i)e^{-it^2}\left(1+e^{x+\sqrt{5}y+\frac{\sqrt{3}}{3}t^2+\frac{2\pi}{3}i}\right)}{1+e^{x+\sqrt{5}y+\frac{\sqrt{3}}{2}t^2}}. \end{cases}$$

In the simulation of Example 5, the number of news and public opinion information frames is 201, the corresponding space step is 0.05, and the time step $dt = 0.0001$. The quintic spline smoothing function is selected, and the corresponding smoothing length $h = 0.9d_0$ is selected.

The numerical solution obtained by the SS-CSPH method is also in good agreement with the real solution when the distribution of two-dimensional news public opinion information frames is uneven. Moreover, the same error accuracy as the uniform distribution of news and public opinion information frames can be maintained in the entire solution area. That is to say, the SS-CSPH method has better applicability to the uneven distribution of news and public opinion information frames in high-dimensional problems.

Example 4. Equation (1) takes $\alpha(t) = \frac{1}{2}, \beta(t) = -10, V(\mathrm{x},t) = -\frac{1}{2}(x^2+y^2)$, namely:

$$i\psi_t + \frac{1}{2}\left(\psi_{xx} + \psi_{yy}\right) - 10|\psi|^2\psi - \frac{1}{2}\left(x^2+y^2\right)\psi = 0.$$

The initial condition is:

$$\psi^0(x,y) = \frac{2}{\sqrt{\pi}}(x+iy)e^{-\left(x^2+y^2\right)}.$$

This equation has no true solution, so the numerical results of SS-CSPH are mainly compared with the results of split finite difference method (SSFD) to verify the effectiveness of the SS-CSPH method. In this numerical simulation, for the SS-CSPH method, the number of news and public opinion information frames is 321, the corresponding space step is 0.05, the time step is dt = 0.0001, the quintic spline smooth function is selected, and the corresponding smoothing length is $h = 0.9d_0$. For the SSFD method, the space step is 0.08 and the time step is $dt = 0.001$.

3 PUBLIC OPINION MONITORING AND GUIDANCE SYSTEM IN THE PROCESS OF NEWS DISSEMINATION FROM THE PERSPECTIVE OF BIG DATA

When a user searches using a meta-search engine, the meta-search engine forwards the search request to its independent member search engine, and each independent member returns the result to the meta-search engine after executing the request. The meta-search engine performs secondary processing on these results and then feeds back the processed results to actual users. The workflow of the meta search engine is shown in Figure 8 a). Web crawler (Crawler) takes a web page as the center point and automatically crawls other pages according to the traversal method of graph theory. Web page information collection is based on this. Before the system starts web crawling, we need to select the initial URL and put the selected URL into a list, which is the initial URL list. The architecture of the web crawler is shown in Figure 8 b).

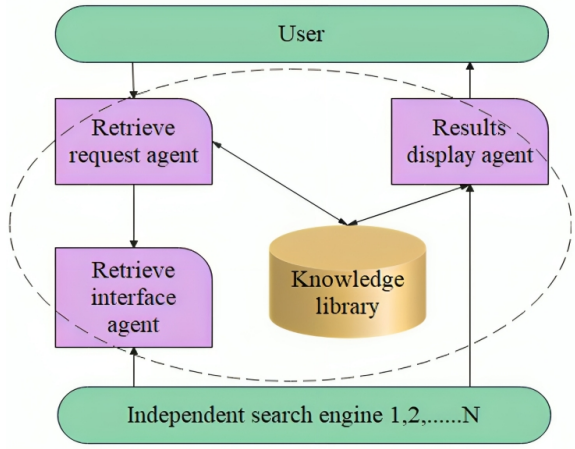
This paper proposes a template-based web page information extraction method. This information extraction method does not require repeated processing of the same type of web pages, so the efficiency is relatively high. In the network public opinion monitoring system, topic information needs to be extracted from a large number of web pages. Based on this, a Web information extraction method based on automatically generated templates is proposed. The schematic diagram of the template generation process is shown in Figure 9.

A total of 32 groups of simulation evaluations are carried out to evaluate the effect of the public opinion detection and guidance method proposed in this paper in the process of news dissemination, as shown in Table 1.

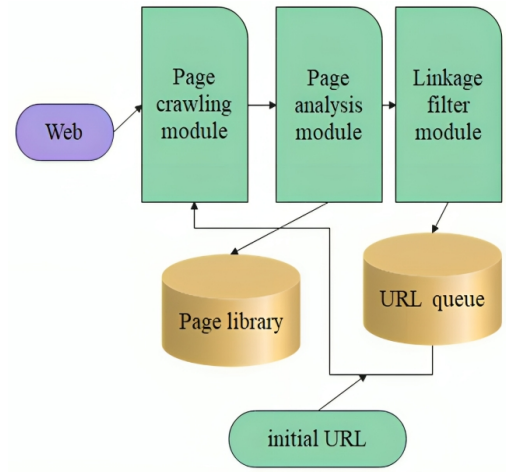
From the simulation evaluation results, it can be seen that the method of public opinion detection and guidance in the process of news dissemination proposed in this paper can play a certain role in the monitoring and guidance of news public opinion.

4 CONCLUSION

In the era of new media, advanced digital technology has accelerated the speed of media dissemination, allowing information dissemination to break the constraints of



a) Workflow of the meta search engine



b) Architecture of the Web crawler

Figure 8. Meta search engine and Web crawler

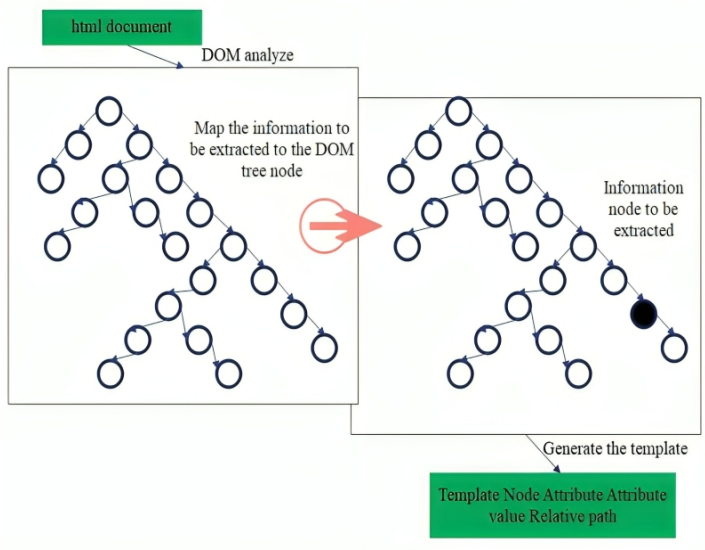


Figure 9. Schematic diagram of template generation process

Num	Public Opinion Monitoring	Public Opinion Guide	Num	Public Opinion Monitoring	Public Opinion Guide
1	84.593	76.799	17	83.814	79.548
2	85.534	81.320	18	87.076	75.558
3	82.830	74.874	19	84.544	77.341
4	88.041	79.953	20	86.772	74.316
5	83.154	81.297	21	82.795	81.639
6	88.831	81.734	22	88.404	81.178
7	86.756	78.126	23	80.816	80.762
8	83.587	81.085	24	80.544	78.115
9	86.801	77.635	25	82.318	73.808
10	83.251	79.402	26	81.177	79.818
11	83.269	79.458	27	87.465	80.306
12	81.369	78.709	28	86.825	74.306
13	81.569	79.319	29	80.381	73.883
14	86.455	76.547	30	86.903	81.088
15	85.731	80.137	31	88.823	74.347
16	84.329	73.839	32	86.434	78.259

Table 1. Simulation evaluation of the effect of public opinion detection and guidance methods in the process of news dissemination

space and time. At the same time, it also disrupts the roles of information publishers, disseminators and receivers, so that they are no longer strictly differentiated. The form of communication of new media is no longer just one-way communication. In the past, traditional media only served as information producers and disseminators. Today, every audience has the potential to be a publisher and communicator, not just a recipient. However, some journalists realize that copying each other, plagiarism is more efficient, and this vicious circle will only continue. Under the dual pressure of external temptation and internal squeeze, the mentality of practitioners will also change, and down-to-earth news production methods often do not get good results. From the perspective of big data, this paper conducts research on the detection and analysis of public opinion in the process of news communication, and analyzes the guidance of public opinion in news communication. From the simulation evaluation results, it can be seen that the method of public opinion detection and guidance in the process of news dissemination proposed in this paper can play a certain role in the monitoring and guidance of news public opinion.

REFERENCES

[1] Cui, L.—Xie, G.—Yu, S.—Zhai, X.—Gao, L.: An Inherent Property-Based Rumor Dissemination Model in Online Social Networks. IEEE Networking Letters, Vol. 2, 2020, No. 1, pp. 43–46, doi: 10.1109/LNET.2019.2952567.

[2] Shan, S.—Lin, X.: Research on Emergency Dissemination Models for Social Media Based on Information Entropy. Enterprise Information Systems, Vol. 12, 2018, No. 7, pp. 888–909, doi: 10.1080/17517575.2017.1293300.

[3] Kaur, S.—Kumar, P.—Kumaraguru, P.: Automating Fake News Detection System Using Multi-Level Voting Model. Soft Computing, Vol. 24, 2020, No. 12, pp. 9049–9069, doi: 10.1007/s00500-019-04436-y.

[4] Marwick, A. E.: Why Do People Share Fake News? A Sociotechnical Model of Media Effects. Georgetown Law Technology Review, Vol. 2, 2018, No. 2, pp. 474–512.

[5] Xu, D.—Pan, J.—Wang, B.—Liu, M.—Kang, Q.: Information Dissemination Model of Microblogging with Internet Marketers. Journal of Information Processing Systems, Vol. 15, 2019, No. 4, pp. 853–864, doi: 10.3745/JIPS.04.0126.

[6] Kelly, M. P.—Martin, N.—Dillenburger, K.—Kelly, A. N.—Miller, M. M.: Spreading the News: History, Successes, Challenges and the Ethics of Effective Dissemination. Behavior Analysis in Practice, Vol. 12, 2019, No. 2, pp. 440–451, doi: 10.1007/s40617-018-0238-8.

[7] Van Bavel, J. J.—Harris, E. A.—Pärnamets, P.—Rathje, S.—Doell, K. C.—Tucker, J. A.: Political Psychology in the Digital (Mis)Information Age: A Model of News Belief and Sharing. Social Issues and Policy Review, Vol. 15, 2021, No. 1, pp. 84–113, doi: 10.1111/sipr.12077.

[8] Ghosh, S.—Shah, C.: Towards Automatic Fake News Classification. Proceedings of the Association for Information Science and Technology, Vol. 55, 2018, No. 1, pp. 805–807, doi: 10.1002/pra2.2018.14505501125.

[9] Shu, K.—Mahudeswaran, D.—Wang, S.—Lee, D.—Liu, H.: FakeNewsNet: A Data Repository with News Content, Social Context, and Spatiotemporal Information for Studying Fake News on Social Media. Big Data, Vol. 8, 2020, No. 3, pp. 171–188, doi: 10.1089/big.2020.0062.

[10] Jadhav, S. S.—Thepade, S. D.: Fake News Identification and Classification Using DSSM and Improved Recurrent Neural Network Classifier. Applied Artificial Intelligence, Vol. 33, 2019, No. 12, pp. 1058–1068, doi: 10.1080/08839514.2019.1661579.

[11] Huang, H.—Wang, T.—Hu, M.—Dong, M.—Lai, L.: Node Attitude Aware Information Dissemination Model Based on Evolutionary Game in Social Networks. Mobile Networks and Applications, Vol. 26, 2021, No. 1, pp. 114–129, doi: 10.1007/s11036-020-01685-2.

[12] Shrivastava, G.—Kumar, P.—Ojha, R. P.—Srivastava, P. K.—Mohan, S.—Srivastava, G.: Defensive Modeling of Fake News Through Online Social Networks. IEEE Transactions on Computational Social Systems, Vol. 7, 2020, No. 5, pp. 1159–1167, doi: 10.1109/TCSS.2020.3014135.

[13] Borges-Tiago, T.—Tiago, F.—Silva, O.—Guaita Martínez, J. M.—Botella-Carrubi, D.: Online Users' Attitudes Toward Fake News: Implications for Brand Management. Psychology and Marketing, Vol. 37, 2020, No. 9, pp. 1171–1184, doi: 10.1002/mar.21349.

[14] Xiao, X.—Borah, P.—Su, Y.: The Dangers of Blind Trust: Examining the Interplay Among Social Media News Use, Misinformation Identification, and News Trust on Conspiracy Beliefs. Public Understanding of Science, Vol. 30, 2021, No. 8, pp. 977–992, doi: 10.1177/0963662521998025.

Wei Shi obtained his Doctorate in the Department of Communication. Currently, he is working as Lecturer. He received his graduation from the Shanghai University in the year of 2013. He also worked in the Nanchang Hangkong University. His research interests include history of communication and movie. He had published more than 10 papers in many reputed journals.

Weiwei Qin received her Master of Arts. Currently, she is a Postgraduate student. She is pursuing her Ph.D. in the Nanchang Hangkong University.