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Retraction

Retracted: SURF Algorithm-Based Data Aggregation Method and Digital Sharing Economy

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Y. Chen, M. Zhang, B. Hyng, and R. Wang, "SURF Algorithm-Based Data Aggregation Method and Digital Sharing Economy," *Mobile Information Systems*, vol. 2022, Article ID 1513129, 10 pages, 2022.

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Research Article

SURF Algorithm-Based Data Aggregation Method and Digital Sharing Economy

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Data aggregation technique removes redundant message in original data, reduces the amount of data transmission, reduces network communication overhead, improves message acquisition accuracy and collection efficiency, and prolongs the effective working time of the network. It is an energy-saving technique widely used in wireless sensor networks, one of the techniques. However, with the continuous operation in the wireless sensor network, the data aggregation technique saves the energy cost of the network, but also brings new security risks to the network. Therefore, how to ensure the confidentiality and integrity of data in the process of aggregation, calculation, storage, and forwarding is the core link of wireless sensor network security research. This paper uses SURF algorithm to study this question. The algorithm in this paper not only has good robustness to the data, but also introduces data aggregation and box filter in the calculation, so that the registration time can be better improved. After the research in this paper, the accuracy of the algorithm in this paper is 19% better than the traditional algorithm. At the same time, the accuracy of the aggregated data increases over time as the channel congestion decreases in the traditional process.

1. Introduction

Nowadays, more and more sharing means can be seen everywhere in life, such as Didi, mobike, and so on. This change is mainly to change the ownership of intellectual property rights into the right to share the use. Therefore, many idle resources can be used instead of being wasted. Therefore, in this case, people's needs have changed [1]. At present, digital aggregation and digital economy permeate all aspects of human production and life, and continuous industrial integration and innovation have promoted the emergence of various new formats and business models of the sharing economy, driven economic transformation, and upgrading and promoted the smooth progress of supply-side structural reform, which has brought about earth-shaking changes in the future business operation mode and people's lives [2]. In addition, people's high utilization rate of the network makes the network the most important message medium in modern society, and the digitalization of message in the network has also aroused great concern [3]. People cannot get rid of the dividends brought by the digital economy. Whether it is daily work and study or personal life, high-tech digital techniques such as cloud and big data have a great influence on us [4]. Among them, data aggregation means and digital sharing economy affect our lives. Compared with the traditional economic model, data aggregation has a higher efficiency of resource optimal allocation, which enables it to achieve transcendental progress in many domains. Therefore, workers should deeply analyze the improvement trend of digital economy and take effective countermeasures to give full play to the effectiveness of digital economy [5]. Data aggregation has been closely linked with people's daily life and work, and cloud computing and big data analysis technique have become the driving force of digital economy improvement [6]. However, in the era of sharing, the improvement of data aggregation is still accompanied by many obstacles. Only by further analyzing the improvement trend of digital economy, can we put forward targeted improvement measures to promote the improvement of digital economy in the sharing era [7]. In the new stage of China's improvement, the digital economy is based on the Internet,

with digital knowledge and message as the key factors of production and digital technique as the core driving force to penetrate all walks of life, realize the linkage of various industries, and promote the optimization and upgrading of economic structure, which brings a new dawn for China's economic improvement. It can be seen that digital economy, as a new economic form, will become a new engine to promote the future growth of China's economy. Therefore, it is of great practical significance to deeply explore the growth effect of digital economy on economic improvement for finding a new breakthrough in economic growth [8]. The rapid improvement of digital economy has promoted industrial transformation and upgrading and brought changes to the production mode and personal consumption pattern of enterprises, and the improvement of traditional industries has also been digitalized. It can be seen that the impact of developing digital economy on China's economy is becoming more and more important. A new round of scientific and technological revolution is bound to bring a new round of industrial transformation, and digital economy is the inevitable outcome of the new round of scientific and technological revolution. Digital economy will be based on the cross-integration of multiple techniques, improve the efficiency of economic improvement, change the existing economic growth mode, promote the upgrading and integration of industries, and then promote the path transformation of China's economic growth and achieve high-quality improvement [9]. Digital economy is a new economic form. The improvement of digital economy is closely related to ICT technique, and the digital economy is accelerating its penetration and changing the operation mode of other industries. To sum up, most scholars believe that digital economy is a new and staged economic form based on data, knowledge, and message, and it is subverting the traditional market economic structure and resource allocation mode [10]. A comprehensive understanding of the improvement status of digital economy and its specific impact on economic improvement will help inject new impetus into China's economic improvement, find new supporting points to promote high-quality economic improvement, and realize sustainable economic improvement. Based on the Internet, digital economy, as an invisible economic form, drives the digital industrialization, digitalization of industries, and the transformation of production and consumption in the whole society and then drives economic growth [11]. The existing research focuses on the direct impact of digital economy on economic growth and its specific mechanism. The improvement of digital economy has positive promoting effect and double threshold effect on economic growth. With the continuous improvement of digital economy, the promoting effect on economic growth gradually increases. Digital economy can significantly promote high-quality economic improvement, but there are significant differences in the effects of digital economy on high-quality economy among different regions.

The innovations of this paper are as follows:

(1) Data aggregation technique is used. Secure data aggregation (SDA) can not only solve the question of insufficient resources of WSNs nodes, but also provide security protection for private data. The benefits of using data aggregation technique in wireless sensor networks are obvious.

analyzed the improvement trend of digital economy in the sharing era, got a good understanding of the environment, and let us know why we should study this topic. The integration of digital economy and sharing economy has promoted the improvement of sharing era. At the same time, the sharing era also puts forward new requirements for the improvement of digital economy, which makes it different from the traditional improvement mode and presents a new improvement trend. In the sharing era, the sharing economy will move towards the digital highway and achieve rapid improvement by integrating the digital economy.

(3) SURF algorithm is adopted. SURF algorithm is not only robust to data, but also introduces data aggregation and box filter in the calculation, which improves the registration time. Data aggregation is the summation of all data, which can realize fast box convolution filtering.

This paper is divided into five parts:

The first part is the background and summary. The second part is the related research and the introduction of this paper. The third part is some related theories, so that readers will not be confused. The fourth part is the algorithm and simulation research, including the experimental content. The fifth part is the summary.

2. Related Work

Sultana suggested that the current improvement level of digital technique is changing with each passing day under the background of economic globalization. Message technique in various countries is infiltrating and merging with all walks of life, and it has continuously injected new vitality into the global economy, which has become a powerful kinetic energy for the new generation to promote economic growth. In this paper, SURF algorithm is used to study the data aggregation means and digital sharing economy. In the practical application of wireless sensor networks, the aggregation process of collected data is directly related to the physical topology, which determines the aggregation node with the best physical location and the transmission path of aggregated data. The research of this paper is of great significance [12]. Cho suggested that the digital economy is mainly embodied in the following three aspects: firstly, the infrastructure represented by the communication network, secondly, an e-commerce, that is, online transactions that are conducted by digitalization, and secondly, the digitalization of economic improvement mode, such as the digitalization of transaction message [13]. It is suggested that the difference between digital economy and traditional economy is that the transaction form between goods and services is carried out in a digital way, and the product sales are different from the traditional marketing channels. Compared with the traditional sales means, the digital economy period

sells products directly online, which has a relatively low cost, and provides consumers with more diversified choices in terms of price and function [14]. Ren et al. suggested the contribution rate of the computer industry to the economy. It is found that the effect of computer expenditure on economic growth is related to time. In the short term (1-2 years), the contribution of computers to total factor productivity is almost zero. In the long term (more than 5 years), the contribution of computer investment to total factor productivity is more than five times that of investment [15]. Sánchez suggested that, in the improvement of digital economy, digital economy is a brand-new way to promote the circulation of commodities and the improvement of service industry. Its trading mode is online, and it flows in the Internet with digital message as the medium. Therefore, its scope includes not only e-commerce, but also the message technique industry developed through e-commerce. The paper also pointed out that it can promote the improvement of digital economy from three aspects: improving innovation ability, carrying out effective macrocontrol, and guiding and perfecting the capital market system [16]. Liu et al. suggested that the rapid improvement of hardware makes the price of message products drop, which has substitution effect on other products, and the cost reduction speeds up the popularization of Internet products. According to Metcalfe's law and Moore's law, Internet technique further promotes economic growth [17]. Peris-Ortiz suggested that digital economy is the inevitable trend of economic improvement nowadays. It is a brand-new economic form, which is developed based on knowledge. The means are digital technique (computer and Internet), which involves all domains of production (manufacturing, management, circulation) and is embodied in digital form. Digital economy itself has the characteristics of digitalization, virtualization, networking, and modularization [18]. Chen suggested to investigate the improvement of digital infrastructure in OECD countries from 1970 to 1990 and found that it promoted the GDP of the country [19]. Popkova and Sergi suggested that the foundation of digital economy is message and communication technique, and all the production and management involved in it are realized through electronization. The interconnection between suppliers and consumers is generated through the Internet. With the help of digital network and communication technique, it provides a global communication platform for people all over the world to communicate and cooperate accordingly [20]. Huo et al. suggested using data from 22 OECD countries as samples and analyzed that digital infrastructure has a positive effect on the ratio of fixed capital stock to gross national product [21]. Bondarenko and Yudina suggested that the digital economy refers to the continuous application of digital technique and digital transactions of related products. It is a new type of economy with virtual characteristics, which takes place in the digital space. The emergence of digital economy has greatly changed the traditional relationship between individuals, enterprises, and society [22].

In this paper, SURF algorithm is used to study the data aggregation means and digital sharing economy. In the practical application of wireless sensor networks, the aggregation process of collected data is directly related to the physical topology, which determines the aggregation node with the best physical location and the transmission path of aggregated data. The research of this paper is of great significance.

3. Related Theories

3.1. Data Aggregation. Wireless sensor networks (WSNs) are an effective means of data acquisition and transmission in the Internet of Things environment. It is a multihop self-organizing network system composed of hundreds of miniature electronic sensor devices. Data aggregation refers to the data processing process in which some nodes (or only one node) collect the perceived data of other nodes, so as to reduce the transmission of original data, thereby reducing the communication bandwidth occupancy rate and saving energy resources. Compared with the traditional network, wireless sensor network has the following outstanding characteristics: sensor network is a network system that integrates monitoring, control, and wireless communication, with a large number of nodes and dense distribution. Secure data aggregation (SDA) can not only solve the problem of insufficient resources of WSNs nodes, but also provide security protection for private data. Its main idea includes two parts: aggregating multiple pieces of message from multiple sensor nodes into one piece of message. The security of data is ensured by encryption algorithm. Data aggregation is an important data processing means in wireless sensor networks. It is a process of collecting data from sensor nodes in the network, summarizing it to the upper aggregation node or aggregator for data analysis and sorting, that is, restoring the real situation in the network. The data aggregation routing algorithm division is shown in Figure 1.

Due to the limited resources of sensor nodes, the security of the data uploaded by them cannot be guaranteed, so data aggregation needs to be carried out at the aggregation node of the upper layer. The benefits of using data aggregation technique in wireless sensor networks are obvious. However, because wireless sensor networks are usually used in sensitive domains such as business, environment, and military affairs, data aggregation technique must meet the security requirements of wireless sensor networks. At the same time, the continuous operation of data aggregation will not only improve bandwidth and energy efficiency, but also have some unique negative effects on network security. Therefore, data aggregation technology must improve the energy efficiency of the network and, at the same time, ensure the security of the whole network data aggregation operation, not at the expense of security. The basic idea of secure data aggregation scheme based on perturbation is that nodes generate one or more random numbers (perturbation factors), and the original data and perturbation factors are fused by polynomial algebraic properties to hide sensitive data without changing some data characteristics. There is no obvious difference between the statistical message after the disturbance and that of the original data. As a data-centric network, the core work of wireless sensor network is to

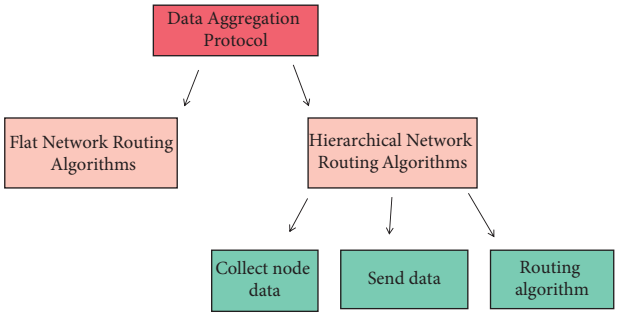

Figure 1: Data aggregation routing algorithm division.

cooperatively perceive, collect, and process the message of perceived objects in the network coverage area and report it to the network deployer, and security is the core foundation and fundamental guarantee of this work. There are security questions or unreliable aggregated data that will delay, mislead, or even destroy the normal work of the whole network. Because RF operation consumes more energy than CPU instruction, it is necessary to reduce communication overhead. The flowchart of data aggregation generation is shown in Figure 2.

Data aggregation can aggregate multiple pieces of data from multiple sensors into one piece of data at one sensor node. After aggregation, the forwarding amount of nodes in the whole WSNs will be greatly reduced, thus achieving the purposes of saving energy, prolonging the network life cycle, and reducing data redundancy. In the process of data acquisition, data is collected at the aggregation node (also called cluster head), and the merged data is transmitted to the base station. The retrieval means of database include data collection and secure access to the message of base station. Data aggregation protocols are divided into topology tree protocol and cluster protocol. In tree-based data aggregation, data flows from the sensor node (child node) to the top node (parent node), and the aggregation takes place on the parent node. Unsafe data aggregation can make the whole network's data collection work fall short, but it is aimless to study the security of sensor network without the core work of data aggregation. Therefore, the core task of the security mechanism of wireless sensor network is to ensure that all nodes collect data safely, realize the secure aggregation of data on appropriate nodes, and transmit these data to sink nodes safely. At present, the research on two key techniques of data aggregation and security in wireless sensor networks has been quite in-depth, but the research on the security of data aggregation technique, especially the security of data aggregation operation in application layer, is still few, which has important research significance.

3.2. Improvement Trend of Digital Economy in Sharing Era. The number of Internet users in China has exceeded 900 million, and the Internet penetration rate is nearly 65%. China already has a huge group of Internet users, which constitutes the prosperous digital economy consumption market in China and lays a solid realistic foundation for the improvement of digital economy. The integration of digital

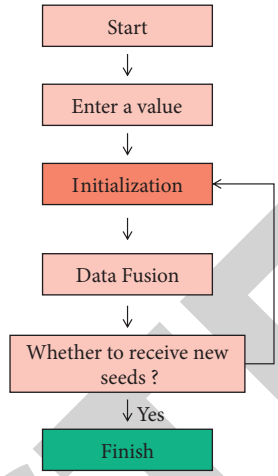

Figure 2: Flowchart of data aggregation generation.

economy and sharing economy has promoted the development of sharing era. At the same time, the sharing era also puts forward new requirements for the development of digital economy, which makes it different from the traditional development mode and presents a new development trend. In the sharing era, the sharing economy will move towards the digital highway and achieve rapid development by integrating the digital economy. At present, the market scale of the sharing economy is gradually increasing. With the participation of more people, wider sharing scope, and penetration of wider fields, the sharing economy will enter a period of all-round development and innovative development, which requires new kinetic energy to participate. Digital economy is the key power to effectively promote the stable improvement of the sharing era. In the sharing era, the sharing economy gradually integrates and infiltrates the digital economy and realizes digital improvement. In the market economy, corresponding to the new economic form of digital economy, the old economic form is industrial economy.

The industry has brought the "big bang of production" to the market, while the digital economy has brought the "big bang of trading." Building a good digital business environment is also an important mission of the blockchain system. Through the intelligent contract mechanism, a digital connection is established between enterprises and consumers, and a sequential transaction record opening mechanism and self-discipline supervision constraint with limited sharing between enterprises and industries are formed, which can effectively avoid contract fraud and moral hazard caused by message asymmetry among enterprises. At present, digital technique has accelerated its penetration into various domains, promoted the economic and social evolution to a higher level, and provided a historic opportunity to break the global digital economy competition pattern. In the current society, the market scale of the sharing economy is constantly expanding, and the broad masses of the people are actively participating. The sharing economy will soon enter a new era of innovation and improvement, so it needs some new kinetic energy as support.

With the continuous development of society, cloud technology and big data have been integrated into all fields of society, providing a guarantee foundation for the development of digital economy and supporting the stable development of shared economic information and trading platform. With the rise and popularization of the Internet and the wide application of big data and cloud computing, the digital economy is booming. In order to achieve rapid development of the sharing economy in the future, it is necessary to increase information sharing, reduce transaction costs, improve transaction matching rate, and promote the transformation of the real economy to digitalization with the help of digital economy dominated by big data and cloud computing.

In the era of message, technique, and knowledge sharing, transactions and decisions can be made on the Internet. At the same time, after the transaction is completed, the docking between orders and warehousing logistics can also be directly realized by means of this interconnection and sharing mode; thus, the transaction activity has broken through the limitations of physical laying, has infinite extensibility and high efficiency, and has formed the trend of digital economy scale improvement of "big bang." And this trend of the big explosion of transactions has also brought a lot of revenue to enterprises in various domains. Digital technique also provides more quality signals and supervision opportunities for both parties to the transaction, forcing enterprises to actively choose products and services with qualified quality. If this kind of credit chain is further expanded, a multilateral credit network around the core enterprises can be formed, and the online presentation of offline resources can be realized by virtue of the intelligent contract mechanism and the mapping traceability mechanism. Therefore, such a data sharing and resource transaction agreement that covers enterprises, industries, and consumers will also promote enterprises to gain larger-scale trust capital with lower transaction costs and bring the market economy to the fast lane of "business environment improvement-mass entrepreneurship-innovation-achievement sharing." With the rapid improvement of digital economy and the country's great emphasis on digital economy, the full integration of digital economy into the sharing era will surely drive the sharing economy to take on the wings of digitalization and move towards the road of high-speed digital improvement.

4. SURF Algorithm-Based Data Aggregation Means and Digital Sharing Economy

4.1. Data Aggregation Based on SURF Algorithm. Speeded-Up Robust Feature (SURF) is a fast and robust feature extraction registration algorithm based on Scale Invariant Feature Transfer ORM (SIFT) algorithm. SURF algorithm is put forward on the basis of SIFT algorithm, which is mainly improved to solve the question of high time complexity of SIFT algorithm. The steps of SURF algorithm are basically the same as those of SIFT algorithm, but the operation speed is increased by 3~5 times. SIFT algorithm is a feature registration algorithm, which was put forward in 1999 and improved in 2004 through the research of scale invariance, radiation invariance, and local invariance detection means. SURF algorithm mainly includes three parts: extracting feature points, constructing feature descriptors, and feature matching. Although SHIT algorithm has strong uniqueness for the local characteristics of data, it has certain robustness for data. However, SIFT algorithm has a large amount of data calculation and registration takes a long time. Because SIFT algorithm takes a long time, SURF algorithm was born. SURF's detection of feature points probably includes the following points: constructing data aggregation, approximating Hessian matrix, constructing scale space, and accurately locating feature points. SURF algorithm not only is robust to data, but also introduces data aggregation and box filter in the calculation, which improves the registration time. Data aggregation is the summation of all data, which can realize fast box convolution filtering. Compared with other algorithms, SURF algorithm not only has better scaling, rotation, translation, and other characteristics, but also has a fast calculation speed, and the improvement of calculation speed largely depends on the establishment of data aggregation. Data aggregation is the data obtained by calculating the original data. Each data of the aggregated data is represented as the data sum of the original data from the original data to the data.

The value of the aggregate data $I_{\Sigma(x,y)}$ at a certain data (x, y) in the data is the sum of all data values from the original data $I(x, y)$ to the whole area of the data, and the expression is as follows:

$$I_{\Sigma(x,y)} = \sum_{i=0}^{i\le x} \sum_{j=0}^{j\le y} I(i, j). \tag{1}$$

$I(i, j)$ is the original data of data point (i, j). After the data aggregation is established, if you want to calculate the sum of all the data in the data, you only need to calculate the data aggregation and simply add and subtract the original data.

The reason why the establishment of data aggregation can speed up the calculation is that after we traverse all the data in data aggregation, the sum of the data in any area of the original data can be completed by addition and subtraction, regardless of the data value of the rectangle. The larger the rectangle is, the more calculation time will be saved.

Let the signal metric and energy metric of node i be

$$\begin{aligned} H_0&: x_i(t) = n_i(t) \\ H_1&: x_i(t) = s_i(t) + n_i(t), \\ \xi_i &= \sum_{t=1}^{M} \left|x_i(t)\right|^2, \\ i &= 1, 2, \ldots, N, \end{aligned} \tag{2}$$

where M obeys approximately Gaussian distribution. And assuming that the noise samples are independently and identically distributed in time and space (*i.i.d*), it can be proved that

$$\begin{aligned} E\{\xi_i|H_0\} &= M\sigma_i^2 \\ E\{\xi_i|H_1\} &= M\sigma_i^2(1+\varsigma_i) \\ D\{\xi_i|H_0\} &= 2M\sigma_i^4 \\ D\{\xi_i|H_1\} &= 2M\sigma_i^4(1+2\varsigma_i). \end{aligned} \tag{3}$$

Among them, $\varsigma_i = \sum_{t=1}^{M} s_i^2(t)/M\sigma_i^2$. Furthermore, that statistical service of statistic ς_i obeys the following distribution:

$$\xi \sim \begin{cases} N\left(M\sigma_i^2, 2M\sigma_i^2\right), & H_0, \\ N\left(M\sigma_i^2(1+\varsigma_i), 2M\sigma_i^2(1+2\varsigma_i)\right), & H_1. \end{cases} \tag{4}$$

Based on the energy estimation, the node i generates a binary random variable φ:

$$\begin{aligned} \xi_i < \Lambda &\Rightarrow \varphi_i = 0 \Rightarrow H_0 \\ \xi_i \geq \Lambda &\Rightarrow \varphi_i = 1 \Rightarrow H_1. \end{aligned} \tag{5}$$

Among them, the local detection threshold Λ is the same for N nodes. The local false alarm probability and local detection probability of node i are as follows:

$$\begin{aligned} p_{fa}^i &= \Pr(\xi_i \geq \Lambda|H_0) = Q\left(\frac{\Lambda - E\{\xi_i|H_0\}}{\sqrt{D\{\xi_i|H_0\}}}\right) \\ p_d^i &= P_r(\xi_i \geq \Lambda|H_i) = Q\left(\frac{\Lambda - E\{\xi_i|H_1\}}{\sqrt{D\{\xi_i|H_1\}}}\right). \end{aligned} \tag{6}$$

The extracted features of data have certain influence on data aggregation, and good features generally have repeatability, uniqueness, and strong robustness. SURF algorithm does not use pyramid but uses box filters with different sizes to process the original data. Because data aggregation is used, the calculation speed is the same no matter how the size of box filters changes. The construction principle of SURF algorithm's characteristic point response differential pyramid is the same as that of SIFT algorithm's aggregation differential pyramid, and the data of the first scale group can be directly obtained by interlaced deletion of rows and columns and downsampling.

Suppose the sender D of the message has a message $s \in Zq$ (q is a big prime number) to send. Take care of $p > s$, D during the sending process. $(t-1)$ elements $a_i(i-1, 2, \ldots, t-1)$ will be selected in the finite domain to form $(t-1)$-order multiple items:

$$f(x) = \Sigma_{i=1}^{t-1} a_0 + a_i x^i \,(\mathrm{mod} p). \tag{7}$$

D: Add the message to be sent to the polynomial as a constant term, that is, $s = f(0) = a_0$. D: Generate an encrypted message for each forwarder $s_r(r = 1, 2, \ldots, n)$:

$$s_r = f(x_r) = \sum_{i=1}^{t-1} a_0 + a_i x_r^i \,(\mathrm{mod} p)(r = 1, 2, \ldots, n). \tag{8}$$

This message will be sent by D to the forwarder and then forwarded by the forwarder to the final receiver R.

R: As long as the encrypted message sent by any t forwarders is received, the original message can be recovered using the Langrange interpolation formula:

$$s = f(0) = \sum_{i=1}^{t} f(x_i) \Pi \sum_{v=1, v\neq l}^{t} \frac{-x_v}{x_l - x_v} \,(\mathrm{mod} p). \tag{9}$$

If the number of encrypted messages received by R is less than t, the data cannot be recovered.

Data operators are used for scale analysis. In practical applications, data operators need to be discretized and modified. Due to the undersampling of data operators, spectrum aliasing will occur. When the variation rate is very low, a new structure will appear when the data is filtered in one dimension, and a new structure will also appear when the data is filtered in two dimensions.

4.2. Algorithm Simulation. A plurality of cooperative sensor nodes deployed in an area report the processed observation results to the aggregation node. Then, after receiving the contributions of all sensor nodes, the aggregation node adopts certain strategies to aggregate these contributions and make a global decision. However, the bandwidth and energy of the microdevices corresponding to these sensor nodes are limited. In addition, the geographical distribution of this system makes it vulnerable to different types of attacks. Considering these factors, it is a challenging task to make wireless sensor networks secure. In WSNs with cluster topology, the cluster head node needs to gather the information of the whole cluster and send it to the base station. Therefore, the cluster head node is the most important node in the cluster topology, and its security and accuracy are related to whether the data in the whole cluster can be fully utilized. In the wireless network security data aggregation technology, the purpose of privacy protection is to ensure that users' privacy data cannot be obtained by other users. Even if the transmitted data is intercepted and cracked, the attacker still cannot restore the sensitive data of the user. Like traditional networks, wireless sensor networks are also faced with many security threats. The local sensor node's decision-making process (i.e., local detection performance) itself will also be threatened by various security threats. The detection performance largely depends on the reliability of these sensor nodes in the network. As can be seen from Figures 3–5, the accuracy of the algorithm in this paper is higher than that of the traditional means. Moreover, as the number of slices increases, BX has more data slices for verifying message.

Only when the base station obtains the number of data not less than the threshold, can the original data be recovered, thus ensuring the security of the cluster head node; ISSA slices the aggregated data of cluster head nodes, and the sliced data can also realize homomorphic addition, thus reducing the traffic. The base station can verify the data through the received data. It randomly selects multiple groups of different data segments from data segments and

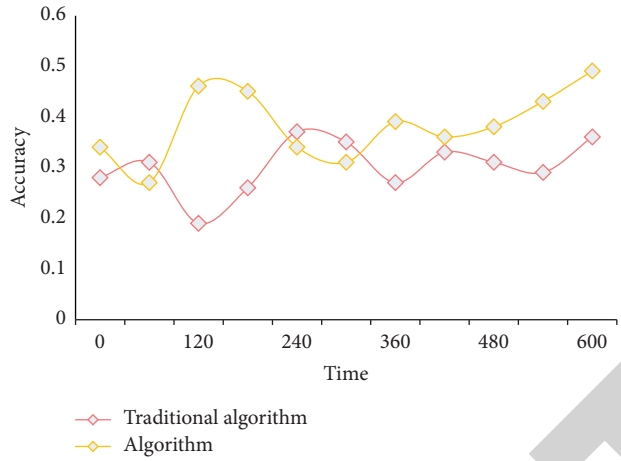

Figure 3: Comparison of graph node accuracy.

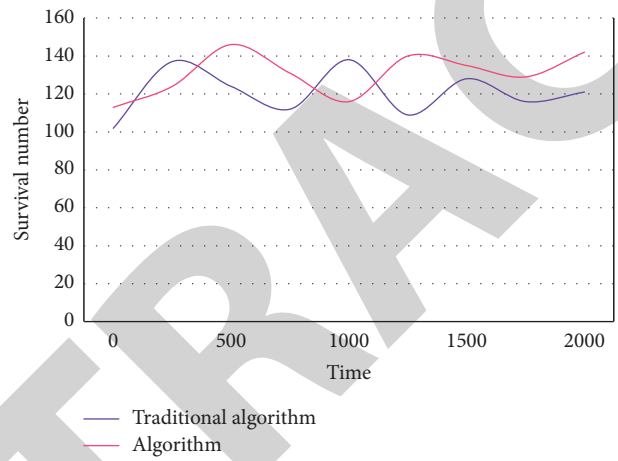

Figure 4: Node survival.

Figure 5: Accuracy of the algorithm in this paper under different data slices.

obtains multiple results through calculation, which can verify each other and improve the accuracy of cluster head node aggregation data. By aggregating the data received by sensor nodes deployed in space, reliable aggregation node decisions can be made on the state of the phenomenon, but it is possible that one or more sensor nodes (destroyed by

Table 1: Operand comparison.

	0	60	120	180	240	300	360	420	480	540	600
Traditional algorithm	3.7	3.5	3.1	4.2	4.5	2.6	2.2	3.6	3.1	4.0	4.2
Algorithm	4.5	4.1	5.0	5.2	3.9	2.8	4.6	4.5	3.7	4.6	5.4

Table 2: Comparison of table data slicing operations.

	0	1	2	3	4	5	6	7	8	9	10
Traditional algorithm	2.7	3	3.2	1.9	2	3.4	3.5	4.1	2.7	3.2	3.4
Algorithm	3.2	3.5	3.1	2.7	2.5	3.3	3.7	3.4	4.3	3.9	4.7

Table 3: Comparison of data accuracy.

	0	60	120	180	240	300	360	420	480	540	600
Traditional algorithm	0.27	0.30	0.32	0.26	0.25	0.41	0.40	0.39	0.32	0.37	0.41
Algorithm	0.33	0.31	0.3	0.18	0.22	0.17	0.26	0.25	0.42	0.50	0.52

attackers) deliberately falsify their local observation results, thus reducing the detection performance of aggregation nodes. To reduce the transmission and processing burden of sensor nodes, each sensor node generates bit local test statistics through energy detection and reports the test statistics to aggregation nodes. From Tables 1–3 and Figures 6–8, it can be seen that the accuracy of the algorithm in this paper is 19% better than the traditional algorithm. At the same time, the accuracy of the aggregated data increases over time as the channel congestion decreases in the traditional process.

Relax the prior condition of the real assumption, assuming that the damaged node (controlled by the attacker) does not know the real state of the target. For the aggregation node, it is assumed that it is not damaged, and test statistics are received from two types of sensor nodes (attacked and not attacked). Due to the limited energy of nodes in wireless sensor networks, energy consumption should be paid attention to while protecting the security of cluster head nodes. Data privacy protection not only is aimed at attackers, but also ensures that users' data will not be leaked and restored by attackers. At the same time, for other trusted users, ensure that these users cannot use the relevant key message they have to crack and restore the user's private data. It is assumed that the link transmission from the sensor node to the aggregation node is error-free. Consider an attacked wireless sensor network composed of N geographically distributed sensor nodes and an aggregation node, and detect unknown and definite signals. At present, the realization of secure data aggregation technique in wireless sensor networks mainly combines cryptographic mechanism and trust management model to effectively resist external and internal attacks, which complement and cooperate with each other. However, the combination of password mechanism and trust management mechanism cannot solve the question of data privacy protection perfectly.

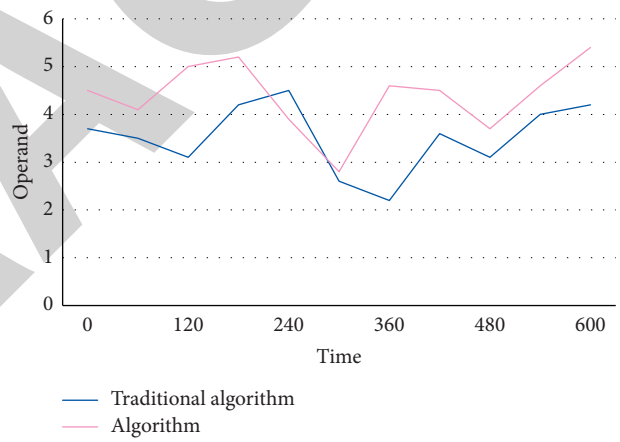

Figure 6: Operand comparison.

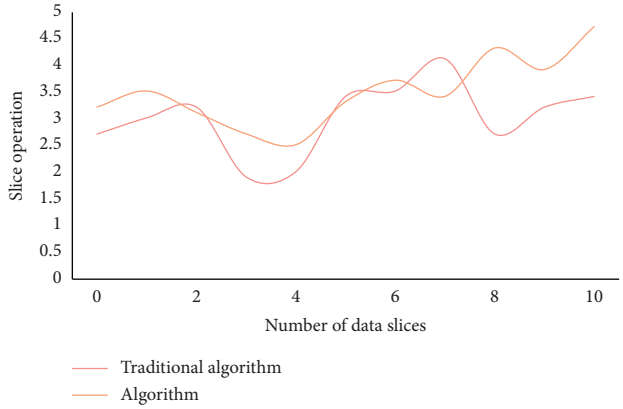

Figure 7: Comparison of data slicing operations.

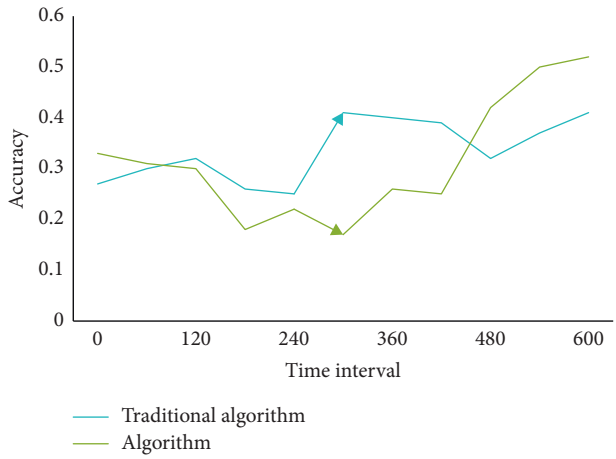

Figure 8: Comparison of data accuracy.

5. Conclusions

With the large-scale popularization and application of WSNs, wireless sensors are playing a more and more important role in military affairs, life, and medical treatment, which brings convenience to people, but also brings some hidden dangers in data security. How to protect the privacy of data in WSNs is not only a difficult question in real life, but also a hot issue in academic research. Data aggregation technique can effectively remove redundant message, reduce data transmission, improve message acquisition accuracy and collection efficiency, and prolong network life cycle. It is one of the energy-saving techniques widely used in wireless sensor networks. However, data aggregation technique not only improves energy efficiency and message accuracy, but also has a certain degree of negative impact on security performance. How to balance the data aggregation function of wireless sensor networks and meet the security requirements in practical application scenarios is the key to design data aggregation protocols. This paper studies data aggregation means and digital sharing economy based on SURF algorithm and has achieved remarkable results.

Data Availability

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no competing interests.

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