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Research Article

Analysis of Cross-Border E-Commerce Commodities in Internet of Things Based on Semantic Traceability Algorithm

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With the advancement of economic globalization and the continuous development of "Internet +" economy, cross-border e-commerce has become an important part of participating in international economic exchanges and developing foreign trade. As the direct participation of consumers, cross-border online shopping has gradually become an important way for people to obtain overseas commodities. The phenomenon of fake products and parallel goods is serious in e-commerce online shopping. How to use the existing Internet of Things to achieve product traceability is an important research topic. For different modes of cross-border online shopping, this paper combines the traceability algorithm with the idea of semantic routing, proposes a Semantic Web-based traceability algorithm, and constructs a quality safety traceability system. In order for consumers to accurately know the product quality of sellers, the product traceability model of cross-border e-commerce relying on Semantic Web is constructed to prevent false information from recording product information from the product source. Through the tracing query algorithm, the simulation results show that the hop number of routes between nodes is 1, and the tracing algorithm can quickly determine the identity of online goods. The network delay is mostly distributed between 0 and 0.05 s, which meets the real-time requirements of the Internet of Things.

1. Introduction

Cross-border e-commerce is developed on the basis of e-commerce, which not only has all the characteristics of e-commerce but also has the characteristics that e-commerce does not have. Cross-border e-commerce is an online trade activity conducted by different countries or different tariff subjects through the media of the Internet and cross-border platforms. It is a new trade mode integrating services, payment, logistics, and other businesses [1]. Cross-border e-commerce has broken down the traditional trade barriers, integrated the trade subjects of different countries, deepened the globalization of trade, and affected the transformation of the global economy. Cross-border e-commerce has the characteristics of e-commerce and cross-border trade at the same time, which is more complicated. The rapid rise of cross-border e-commerce has brought more diversified business models for enterprises. The international circulation of commodities has more diversified channels, so that the resources of different countries have been optimized, conducive to the realization of a win-win model. For cross-border buyers, cross-border e-commerce provides them with a broader vision, and they can easily and quickly buy their favourite goods on cross-border e-commerce platforms. The virtual nature of the Internet has had a great impact on cross-border e-commerce, which is very different from the traditional trade model. Trans-e-commerce has characteristics that traditional trade does not have, such as paperless and intangibility, which have brought great impact to the current traditional trade [2]. In today's open network environment, the authenticity of these information often needs to rely on data traceability. Data traceability was only used in database and data warehouse system at the earliest and later developed to various fields with high requirements on data authenticity, such as biology, history, archaeology, astronomy, and medicine. With the rapid development of the Internet and the frequent occurrence of network cheating, people are more and more suspicious of the authenticity of data, the authenticity of data requirements are more and more high. Data traceability has become an effective way to study the authenticity of data, setting off a wave of data traceability research upsurge, therefore, data traceability tracing gradually expanded to all walks of life. At present, the research fields have covered geographic information system (GIS), cloud computing, grid computing, ubiquitous computing, wireless sensor networks, and semantic networks. Among them, data traceability is the most popular research field in database and workflow. Applications driven by traceability data will integrate and fuse some data. If the traceability information of these original data is not recorded, the authenticity and validity of the fused data will be reduced. The online market is flooded with a large number of fake goods and parallel goods, which to a certain extent reduces the credibility of online retail enterprises [3] and brings losses to consumers. Therefore, how to trace online goods efficiently and quickly to determine whether they are genuine or not is an urgent challenge we are facing at present.

Internet of things is the computer, Internet, and mobile communication network after the fourth technological revolution, the world's information industry to all kinds of information sensing devices combined with Internet and form a huge network, implement physical interconnection, in real time for object identification, location, tracking and monitoring purposes, comply with the requirements of the traceability system. Due to the virtual network nature of cross-border e-commerce, consumers are unable to know the specific location and product quality of sellers, which easily leads to sellers selling inferior goods, causing harm to consumers' health and productivity [4]. Cross-border e-commerce all have independent demands for business interests, and members are more enthusiastic about sharing the business information of other enterprises than their own enterprises. This tendency of egoism leads to the incompleteness of information transmission in the information chain between enterprises, which leads to the degradation of the network information system expected to be constructed by cross-border e-commerce, and the discontinuous information network seriously hinders the application efficiency of product quality traceability technology in cross-border e-commerce.

2. Related Work

With the development of Internet and e-commerce, cross-border e-commerce has gradually become a new engine to promote the growth of China's foreign trade. The proposal and application of the concept of traceability system, to a certain extent, has become a great help to strengthen the supervision of e-commerce, but the lack of laws, information asymmetry, and technical barriers to traceability have also become an important constraint for its weak promotion and slow progress. Pauwels et al. identified and evaluated the risk factors of e-commerce projects, analyzed the content of the operation process of B2C e-commerce enterprises, and constructed an evaluation index system for the development level of e-commerce platforms [5]. In terms of the influencing factors of cross-border e-commerce, Wang et al. explained the reasons for the development of cross-border e-commerce. Due to its virtuality, cross-border e-commerce will lead to serious information asymmetry of transaction subjects [6]. Based on the semantic tracing algorithm, Bernstein et al. proposed the method of coordinated packet trace-back and constructed the whole path by using the broadcast characteristics to exchange information between forwarding nodes and listening nodes [7]. Qian et al. proposed the method of contact-based traceback in wireless sensor networks, which enabled each node to construct a path to connect to a contact through the contact list and eventually traced back to the data source node [8]. Wang et al. can quickly construct the trunk part of the path composed of cluster head nodes by using hierarchical marking method and reconstruct the detailed path within each cluster. They proposed the algorithm of probabilistic marking traceability and stored the encrypted node information through nesting [9]. These traceability algorithms have their own advantages and disadvantages, but they are not suitable for the traceability of e-commerce products.

At the top of the Semantic Web technology stack, the logic, validation, and trust layers have not been standardized and are also the focus of current Semantic Web research. The logic layer provides inference rules and axiomatic constraints, the verification layer verifies inference results, and the trust layer is the guarantee to evaluate the reliability and security of the output of Semantic Web. Traceability provides metadata information for the creation and processing of semantic M resources, which is an important means to solve trust. Credibility is usually a subjective judgment, which needs to be derived based on context, while traceability can provide objective records for trust assessment. Through the analysis of the traceability information, the user's reputation can be evaluated, or the combination of the two can be evaluated for trust. Alfian et al. established links between development data, namely, associated data. Associated data are a new way of publishing network resources, which uses URI and RDF data model to publish, share, and link all kinds of data [10]. González-Amarillo et al. promoted document-oriented web to data-oriented web, realized semantic association of different resources in distributed environment, and formed the cornerstone of the next generation of World Wide Web [11]. Under the initiative of World Wide Web consortium W3C, more and more data are published in the form of associated data, forming an associated open data cloud. At present, there are a lot of researches using linked data to publish traceability or metadata information. Appelhanz and others to realize the traceability for the development of data sharing and interoperation, in view of the correlation data in the field of traceability requirements, not only covers the data to create the traceability but also including the traceability information, when the data access allows publishers to traceability information released in the form of associated data in data networks, support the user through the SPARQL query language traceability information [12]. Different traceability information models usually cater to the traceability needs of different application fields, communities, or user groups, resulting in the heterogeneity of the representation of traceability models, which brings challenges to the sharing and interoperability of data traceability. The tracing information can be a description of a web resource. There is still a lack of a mature technical framework for how to publish this information and how to adopt the necessary policies to ensure the security of the traceability information itself. How to create this traceability information is the direction of traceability research.

3. Cross-border e-Commerce Framework Based on Semantic Traceability Algorithm

3.1. Semantic Web Framework. This design establishes the association in the web data and forms the data network. Semantic routing uses the mapping relationship between query keywords and nodes to forward query requests to some nodes that are considered most likely to meet the request. This method is similar to prefix matching, but it directly maps the resource key to the resource index position, and the query key adopts the same semantic representation as the resource key [13]. In this paper, the corresponding relationship between the query key word and the index position of the perception node is established, and the query packet is routed to the corresponding perception node through the query key word. Determining the appropriate query key is the key of the algorithm. For data structures, select the contents of List_D, List_S of each perception node as the resource key. Query keywords are represented by the same semantics as resource keywords. Figure 1 shows the technology stack for the Semantic Web, similar to the seven-layer protocols of the existing web. At the bottom is the coding of data resources, which uses uniform resource identifier to identify resources. The XML specification is defined at the syntax level, which provides element syntax that describes the structure of the content of a document, but does not establish associations between its contents and the corresponding semantic information.

As you can see from the figure, layer 1 is the foundation of the whole Semantic Web, where URIs are responsible for identifying resources, and unicode is responsible for encoding resources. The second layer is the syntactic layer of Semantic Web. XML is the de facto standard of data representation and data exchange. The namespace mechanism is introduced, and URI index is added in front of markup to resolve such conflicts. XML schema provides a mechanism for data validation of XML documents. XML query is a technical standard based on XML. The third layer is the data interoperability layer of the Semantic Web. The resource description framework uses triples to represent resources, attributes, and their values on the Internet. The fourth layer is the knowledge set of the Semantic Web. Ontology consists of conceptual model, definition, formalization, and sharing. The goal of ontology is to extract domain knowledge, unify the common understanding of knowledge in a certain domain, determine the commonly recognized vocabulary in the domain, and give a clear definition of these vocabulary and the relationship between the vocabulary from the formalization mode at different levels. Layer 5 rules and their description are the basis of automatic reasoning. Level 6 verifies the result of reasoning. Layer 7 is responsible for providing the application with a mechanism to decide whether to trust a given argument. The establishment of trust layer enables intelligent agents to realize personalized services on the network and interact with each other automatically, thus providing reliability and security.

In the middle tier of the Semantic Web technology stack, RDF, OWL, and SPARQL form the core of Semantic Web technology. RDF is a language for data exchange and data storage. Resource description framework (FRF) describes the data model of data and becomes the most core standard specification of data model in Semantic Web. It interpolates data resources in the form of "subject-verb-object" triad and can be expressed by a variety of syntax. RDF models express links between web resources without providing domain-specific semantics, while RDF schema (RDFS) defines vocabularies for describing resource attributes and classes and provides modelling primitives that enhance RDF's ability to describe resources. Due to the limited semantic expression ability of RDFS, W3C proposed a more powerful ontology modelling language: web oOntology language. WOL has become a powerful data modelling language in the Semantic Web community by providing additional vocabulary for describing properties and classes of resources. The PARQL language is an RDF query language that can retrieve and manipulate data resources stored in an RDF model.

3.2. Semantic Traceability Algorithm. This algorithm designs three pairs of keys, which are public key, private key, and private key implanted in commodity awareness devices. The public key and private key are released through official channels and can be queried by consumers. The static property list of the perception node before delivery is encrypted by public key [14]. The sensing node starts the sensing device at each new sales transfer place and executes the tracing algorithm. The remaining time is in hibernation state to save resources to the greatest extent. The tracing algorithm describes that all nondeep sleep nodes wake up and sense all neighbor nodes within their own path range. Deep sleep nodes can be read and written by other nodes to save resources to the greatest extent. Set List_Neighbor to 1 to sense the current location. Public key decryption sends the query key and returns the query result. Read the content from the returned result of QK and compare it with the detected result. If the result is consistent, construct TA_Nowx to ensure the accuracy of the current location information to the greatest extent. Flagn reads the result from QK, checks the result in turn, if 0, continues to check the next node until it finds the node. Read the content from the return result of QK and compare whether TA_Nowx exists in TA_Nown. If so, it indicates that the current n node is a cargo. List_Neighbor is changed to 0 to prevent further writes and is encrypted with the private key to prevent unauthorized merchants from modifying the private key. Destroy the private key to prevent unauthorized vendors from obtaining it. Illegal merchants cannot obtain the private key and cannot encrypt the forged or tampered

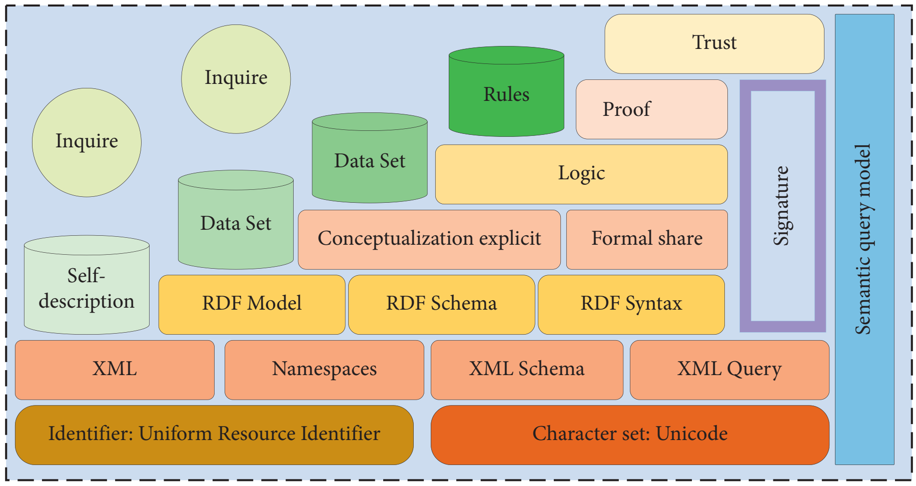

Figure 1: Semantic Web framework diagram.

commodity information legally. The query algorithm can easily detect whether the commodity information has been modified. If n does not exist, it indicates that n is a parallel object and is encrypted with its private key. The private key is not published, so the information encrypted with the private key cannot be decrypted and can be identified as parallel goods.

3.3. Traceability Query Algorithm. After receiving the purchased product, the consumer obtains the public key and private key through official channels and starts the query algorithm in the perception node to determine whether the purchased product is genuine or not [15]. Query algorithm description public key decryption. If the decryption fails, it indicates that the static information of the product is tampered or forged by an illegal middleman. The query result shows that Nordex is fake. If the decryption is successful, obtain the ID and query it on the official website. If it is consistent, the result shows that Nordex is genuine; otherwise, it is fake. Decryption with the private key may require several times. If the decryption fails, the dynamic information of the commodity is tampered or forged by an illegal middleman, or is identified as parallel goods by other nodes. The query result shows that the no-dex is parallel goods. If the decryption is successful, obtain TA and check on the official website. If the decryption is consistent, the result shows that no-dex is an existing product, otherwise it is a parallel product.

It can be seen from the process of the traceability algorithm that the query node sends the request QK and TA to the node with the surrounding path of 1. Since the queried information is stored by itself, it can directly respond to the query node. Let the total number of sensing nodes be N. In the information writing stage, the writing node successively searches for the destination node that meets the condition in the neighbour node whose path is 1. In the one-off tracing algorithm, each node is written only once. Open-source modular component-based open network simulation platform can simulate the traceability algorithm well. In this paper, the traceability algorithm is analyzed from two aspects of network delay and route hop count. As can be seen from Figure 2, the network delay of the traceability algorithm in this paper is mostly distributed between 0 and 0.05 s. The route hop count between nodes is 1, and the traceability algorithm is simple and the transmission delay is small, which meets the real-time requirements of the Internet of Things.

3.4. Quality Safety Traceability System Construction. Due to the virtual network nature of cross-border e-commerce, consumers are unable to know the specific location and product quality of sellers, which easily leads to sellers selling inferior goods, causing damage to consumers [16]. Cross-border electric business platform to establish perfect credit evaluation system, promotes the integrity of cross-border sellers of goods, save the record cross-border buyer for goods of evaluation, to build the brand effect of cross-border sellers, which makes more and more cross-border sellers to choose the good faith management, will consider their own interests to maximize and choose and buy good faith transactions. The unique distributed consensus algorithm and timestamp technology of traceability system can ensure the authenticity of data in quality traceability system. The information generated by each node above will be uploaded to the quality traceability system in the form of files, data, or videos for encryption, and the traceability algorithm ensures the authenticity of the encrypted information. As the product-related information that consumers can query, such information can deepen consumers' understanding of cross-border commodities. In order to ensure that the cross-border product information queried by consumers is unique, a special process has been adopted to make the product traceability code to ensure that it cannot be forged and copied. By scanning the source code of goods, consumers can obtain the production, quality inspection, transportation and other information of cross-border goods, so as to identify the authenticity of goods, guarantee the authenticity of cross-border goods for consumers, and

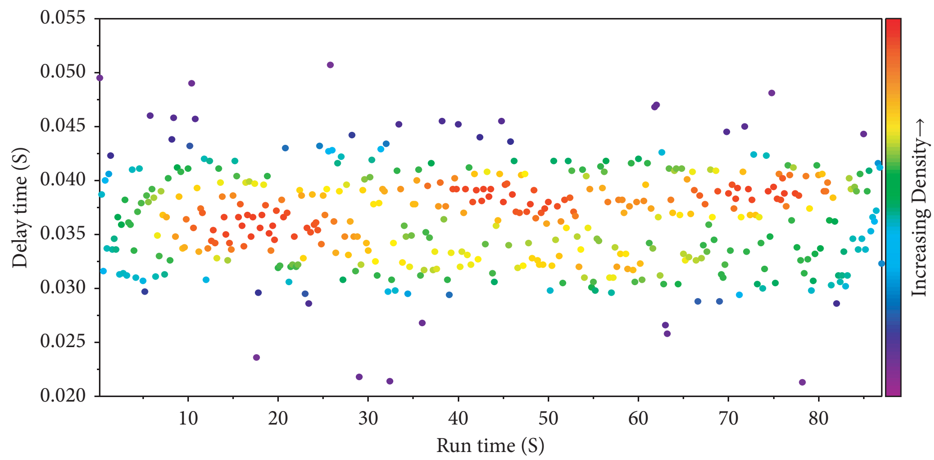

FIGURE 2: Network delay graph of traceability algorithm.

improve consumers' trust in cross-border goods. The quality traceability system ensures the authenticity of cross-border goods from the source through product production information and traceability source code, the authenticity of information through monitoring videos uploaded in quality inspection and transportation links, and the upchain of information in the whole process of purchasing goods provides consumers with channels to query the real information of goods and evidence to protect their rights. It has successfully established a traceability system that can control the quality of cross-border goods and solved the trust problem faced by cross-border e-commerce. The overall architecture of the traceability system is designed in this paper, as shown in Figure 3.

The input of this design is the source code of the project being tested. In this stage, the function call relation of the whole project is calculated, the global information is collected, and the global modification summary is calculated and generated. The visitor design pattern is then used to traverse the abstract syntax tree to obtain the control flow diagram [17]. The intermediate results in the preprocessing are saved for future use in the traceability process. Traceability process is the core of traceability analysis, which includes three modules, namely node analysis module, fixed-value information identification module, and precursor node calculation module. The node parsing module is used to parse the node content. The constant value information identification module is used to determine whether the current analysis variable is the terminal, so as to determine whether to terminate the traceability analysis. When the updated target point is determined as the terminator in the fixed-value information identification module, the traceability analysis is stopped; otherwise, the iterative analysis is continued. The precursor node computing module is used to calculate the next traceability node of the current analysis node.

4. Cross-border e-Commerce Product Traceability Model

In the current mainstream e-commerce transaction mode, every transaction subject is changing, especially customers with great randomness and liquidity [18]. In product information traceability, all parties in the supply chain need to actively participate and cooperate with each other. On the basis of focusing on customer management and different methods to deal with different products, it establishes product information traceability and anticounterfeiting mechanism, collaborates in all links of the product supply chain, and conducts open and transparent information management. In terms of customer dynamic management in the product information traceability model, cross-border e-commerce platforms contact numerous suppliers to facilitate one-stop shopping. At this stage, e-commerce platforms rely on powerful data processing and storage capabilities. The consumer account management function of e-commerce platform uses traceability algorithm to track the product information of the system [19]. In terms of the design of traceability model of physical product information, the products provided by e-commerce platform can be divided into physical products and nonphysical products. Traceability algorithms prevent false information from recording product information from the product source. The product traceability model of cross-border e-commerce on business platforms is shown in Figure 4.

The data in the data layer of the Internet of Things are supported by the traceability algorithm. Traceability can be used to monitor multiple links of products to ensure the authenticity of data. At the same time, the electronic transaction information of products will also be stored in the product supply chain data block storage system, and then the product information provided by the Internet of Things and e-commerce online transaction information will be integrated to form a closed-loop system of physically integrated e-commerce transaction information [20]. Products in every link of the supply chain traceability model under the environment of existing information sharing, if e-commerce platform company is used as a building product traceability and information security system of the central coordination mechanism, coupled with the e-commerce platform with mass of data, rich management experience, and advantages of a large number of active users, it can better solve the current problems. The traceability of product information lays a solid foundation for the realization of product

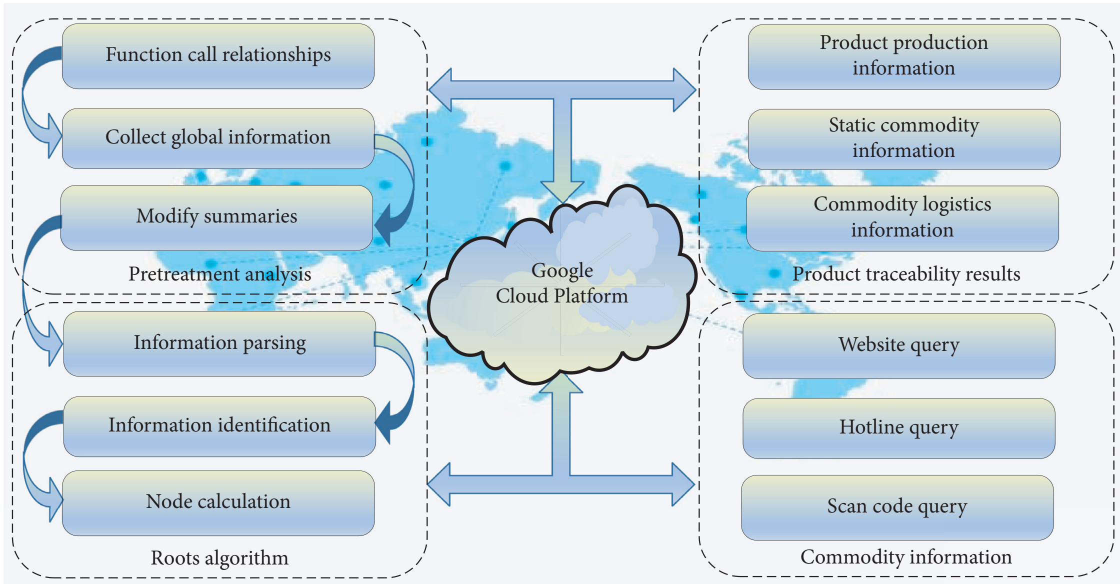

Figure 3: Quality safety traceability system diagram.

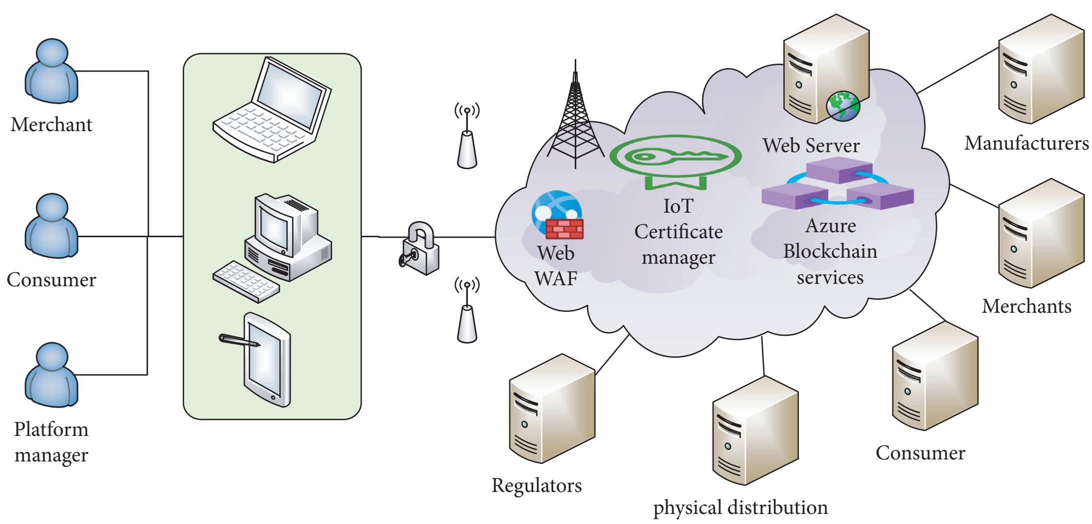

Figure 4: Merchandise traceability model of cross-border e-commerce on business platform.

anticounterfeiting. The real-time dynamics of product information can also track all gaps in the production process and fill in the information gaps. Product security also needs to be strengthened. E-commerce platform relies on its dominant position in the supply chain and powerful data processing ability to build the product information system. E-commerce platforms combine the strengths of manufacturers and carriers to build traceable IoT products. The Internet of Things collects all product information through a unified coded identification system and enters product information into the system. These data are safe, reliable, authentic, and tamper-proof [21]. Consumers can use e-commerce platform application terminals to query the information of purchased products. Improving the legal knowledge of consumers in all aspects of the transaction process, strengthening market supervision, and clarifying market regulators are also important factors affecting the traceability and anticounterfeiting of product information.

5. Analysis of Cross-border e-Commerce Commodities in Internet of Things

5.1. Sample Selection and Data Collection. This paper collects logistics list data from November 2018 to December 2018 to analyze the choice preferences of consumers of different genders and ages in different regions in cross-border shopping according to the data characteristics and analyzes the differences of consumers of different genders and ages in different regions in purchasing the same goods in different countries. Skin care products in cross-border market are indispensable necessities for women, with a large import volume. Moreover, there are many skin care product sellers on taobao global shopping platform, and the market transaction volume is large enough to be used as samples for research. The quality of skin care products of the same brand varies greatly, and the price also varies greatly. In the transaction, cross-border buyers and sellers have different levels of understanding of information. Therefore, cross-border buyers are at an information disadvantage and do not know whether the real quality of goods is consistent with what the seller describes, thus causing adverse selection. Research on trust mechanism of cross-border e-commerce can reduce the occurrence of adverse selection to a certain extent.

5.2. Selection and Descriptive Statistics of Commodity Variables. Data traceability collects and stores the traceability information of specific contents of individual data. When it is necessary to trace a certain data, specific traceability methods are used to trace and display the source and production process of data. Therefore, the realization of real and effective data traceability is often inseparable from the safe and effective management of traceability information. When using the data traceability model to realize data traceability, it mainly focuses on the management of traceability information, and the management of traceability information mainly includes the collection, storage, and query of traceability information. The corresponding implementation method has been explained for traditional tracing information query, but due to the response time delay, the tracing information is not true and the validity is low, and finally the true and effective data tracing cannot be realized. In order to test the tracing information query rate, this paper compares the tracing information query method with the traditional tracing algorithm in the case of different total amount of tracing information. This paper compares the query time of the two different methods when the total amount of experimental traceability information is 2000, 3000, 5000, and 7000. The abscissa is the number of traceability information corresponding to the traceability object, and the ordinate represents the query time. The test comparison figure is shown in Figure 5.

As can be seen from the above test figure, when the total amount of traceability information is certain, the time of information query based on traceability is much lower than that of traditional query methods. The traceability system of cross-border e-commerce makes it easy to record commodity information and ensures the reliability of commodity data information. The use of traceability algorithm combined with Semantic Web to realize the entry of commodity information can enable consumers to have a comprehensive understanding of the source and agents of cross-border commodities and ensure the authenticity and reliability of commodities. Cross-border e-commerce systems have increased consumers' access to commodity information. Through the blockchain system, consumers can not only know the information of commodity production enterprises but also obtain detailed information of commodity production, packaging, quality inspection, and other processes, so that consumers can query the information they want to know in a short time and improve the shopping efficiency of consumers. However, as the total amount of traceability information increases, the query time based on traditional query methods will increase slowly.

5.3. Accuracy of Product Traceability Information. In this paper, the function call relationship of different algorithms was analyzed, and each algorithm was sampled. The number of samples of each algorithm was 100. Then, the accuracy of the system was obtained through system analysis. Cross-border e-commerce system uses the traceability characteristics of traceability algorithm and time stamp technology to establish cross-border goods warehousing and transportation monitoring system. The accuracy of the system can be obtained by sampling and comparing the detection results of the traceability algorithm. The sampling experiment results are shown in Figure 6.

Through the analysis of the experimental results, it can be known that the calculation results of the traditional algorithm are not very accurate when analyzing the target point traceability algorithm. In this paper, 100 sampling points were selected in each project, totaling 300 abstract points. The traceability algorithm of these abstract points is analyzed, and 300 sampling points are found to be correct. It can be known that the accuracy rate of the traceability analysis of the target points by this method is about 90%. After analyzing the traditional tracing algorithm, 159 sampling points were found to be correct, with an overall accuracy of 82.5%. Through the cross-border e-commerce system, consumers can query logistics information in real time, monitor the whole process of cross-border commodity transportation, and provide information such as commodity quality inspection and logistics real-time monitoring.

5.4. Descriptive Product Analysis. According to the data characteristics from the perspective of commodity categories, such as consumer age, respectively, on cross-border descriptive analysis the clinch a deal the quantity, clinch a deal the price of a commodity in the SPSS software, will be selected as a variable quantity, commodity categories selected as the grouping variable, you can get goods between categories and clinch a deal the quantity case summary. According to the data characteristics, it can be found that classified data, namely qualitative data, are the main data and the sample size is large. If the sample type factor analysis is selected, the capacity and speed are not adequate. Therefore, on the basis of descriptive analysis, the classification data are numbered or represented by numerical codes, and simple correspondence analysis and multiple correspondence analysis are carried out to obtain the internal relationship between users with different characteristics and product selection. According to the correspondence analysis of different characteristic variables, the factor load plans of different line variables and column variables are obtained, respectively. Due to the large categories of goods, this paper only analyzes the relationship between the user characteristics of luggage products, beauty products, medicine and health care, clothing, shoes and hats, and milk powder. In

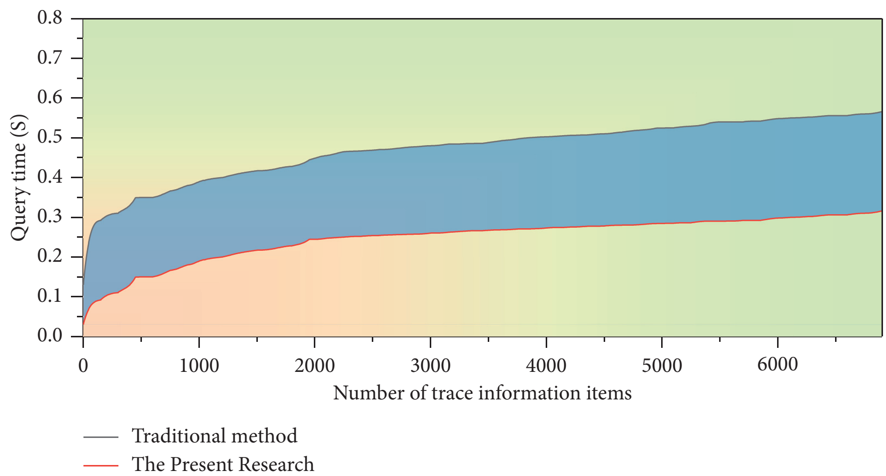

FIGURE 5: Tracing algorithm to compare the query time test results.

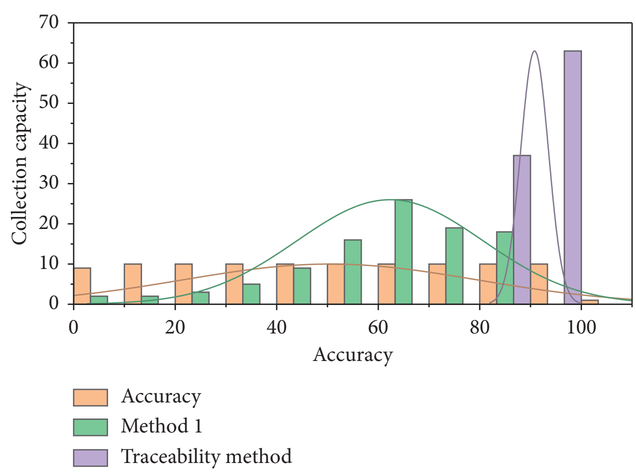

FIGURE 6: Diagram of sample experiment results.

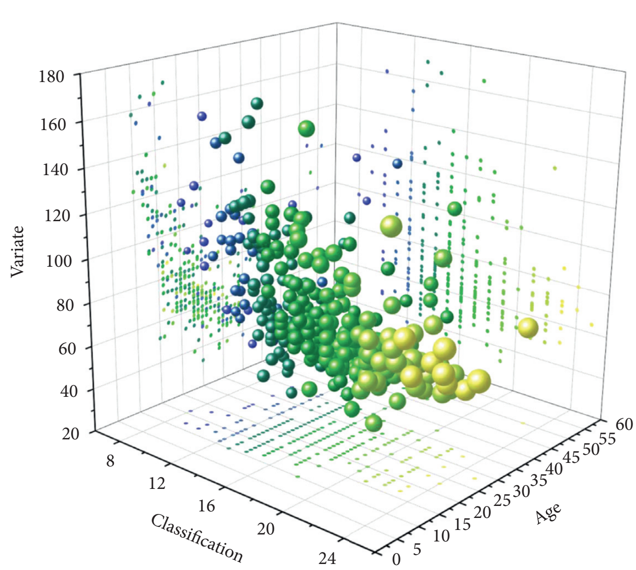

FIGURE 7: Plane graph of factor loading.

the factor load diagram obtained, coordinate points of different categories are connected with the origin, which is temporarily called the class line, and the vertical distance between coordinate points of other characteristic variables and the class line is judged. The distance is inversely proportional to the correlation, and the shorter the distance, the greater the correlation. Factor loading diagram is shown in Figure 7.

As can be seen from the figure, the gender and age coordinate point with a short vertical distance from the origin crossing ray where the goods category is located is 38, followed by 46. Among them, the corresponding gender and age code is 35 for males aged 36–40 years, and the corresponding code is 45 for females aged 36–40 years. The sex and age coordinates with a short vertical distance from the product category for beauty makeup and skin care are 37,47. The sex and age coordinates with a short vertical distance from the origin ray of medical and health products are 44 and 34. The coordinates of gender and age with the shortest vertical distance from the origin ray of clothing, shoes, and hats are 45 and 35. The gender and age coordinate point with a short vertical distance from the origin crossing ray of milk powder is 442, 33, 43. It can be concluded that bags are the most popular among men aged 35–40 years and have the greatest demand, followed by women aged 35–40 years. The customer base of beauty products is distributed between 45- and 50-year-old women and the same age group of men. Medical products are most popular among women aged 30 to 35 years, followed by men in the same age group. The main customers of clothing, shoes, and hats are consumers aged 36–40 years, and the purchasing power of women is higher than that of men. The main customers of milk powder are women under 20 years old and 21–25 years old, followed by 26–30 years old.

6. Conclusion

As domestic consumers' enthusiasm for overseas shopping rises, cross-border e-commerce industry stands out in this wave of cross-border shopping, bringing a fierce impact on traditional trade worldwide. This paper proposes a semantically based product traceability algorithm for e-commerce online purchase in the Environment of Internet of Things. The innovation of this traceability algorithm relies on semantic traceability algorithm to prevent illegal merchants from tampering and forging commodity information and help consumers to quickly judge whether the purchased goods are genuine goods or not. Cross-border electricity data as the research object, through the data mining, based on the Semantic Web to IoT cross-border e-commerce framework, traceability queries, and the empirical analysis was carried out on the goods, reduce the risk prevention and control of cross-border e-commerce, in certain cases, traceability information total based on the time of the query information much lower than the traditional query method. The accuracy of the system is up to 90% through the detection results of the traceability algorithm. Through the cross-border e-commerce system, consumers can query logistics information in real time, monitor the whole process of cross-border commodity transportation, and provide goods quality inspection and logistics real-time monitoring information. There is a lack of collected Internet of Things data set, transaction data, and backup traceability information in the design. In the future, in-depth research on real-time monitoring efficiency will reduce the difficulty and increase the speed of traceability.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest.

Acknowledgments

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