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Retraction

Retracted: Abnormal Concentration Detection Method of Chemical Pollutants Based on Multisensor Fusion

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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) Manipulated or compromised peer review

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] W. Song, "Abnormal Concentration Detection Method of Chemical Pollutants Based on Multisensor Fusion," *Journal of Sensors*, vol. 2022, Article ID 2936960, 10 pages, 2022.

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Research Article

Abnormal Concentration Detection Method of Chemical Pollutants Based on Multisensor Fusion

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China is a big industrial producer, but also a big producer and user of chemical materials. Although the use of chemical materials has improved the level of industrialization, it has also caused harm to the environment and ecosystem. With the acceleration of China's industrialization, more and more attention has been paid to the problem of chemical pollution. The pollution of water resources in China has seriously damaged the balance of ecological environment and is also an important factor threatening people's own health. The detection of chemical pollutants in water resources, especially organic pollutants, has a long way to go. To solve this problem, this paper designs a method of chemical pollutant concentration detection based on multisource information fusion and analyzes the performance of the detection system. Firstly, this paper introduces the main types of situations of chemical pollution at present. Secondly, a multisensor fusion model based on BP neural network is established, and the collected chemical pollutant samples were input into the model. Finally, the quantitative and qualitative analysis of the detected pollutant concentration results shows that the proposed method not only has good detection effect of chemical pollutant concentration but also has good practicability. In a word, the proposed method not only has good theoretical significance but also has certain potential application value.

1. Introduction

Industrial development not only brings convenience to production and life but also brings great disadvantages. A large number of organic chemical pollutants are discharged into the water body, many of which have complex structures and are difficult to degrade and have caused serious impacts on the water environment after accumulation [1, 2]. In the face of more and more serious situation of environmental pollution, prevention and control from the source are particularly important. Sensing technology is a new analysis technology derived from electrochemical analysis. It uses the interaction between the detected substance and the modified photoactive substance to observe the signal changes of photocurrent or photovoltage before and after the identification process of biomolecules to determine the concentration of the substance to be detected. The method has the advantages of low cost and easy operation. However, due to the use of some of the more precise electrochemical instruments, most of the detection still needs to be carried out in the laboratory, which is difficult to achieve real-time detection, which is not conducive to the wide application of environmental monitoring and detection [3].

China's highly developed urbanization and industrialization have provided people with richer material enjoyment. The vigorous development of economy has been accompanied by more and more serious environmental pollution, among which chemical pollution is the most serious. In recent years, China's water bodies have suffered from serious chemical pollution. The main ways of pollution are illegal discharge of industrial waste water, unreasonable disposal of urban sewage, and nonstandard chemical use. As China's sewage treatment capacity only accounts for about 20% of the total sewage, 70-80% of sewage (about 30 billion tons) is discharged directly without treatment. According to the statistics of water resources in China's major cities, their groundwater shows different levels of chemical pollution. Half of the contaminated sections are in the country's seven major river systems, 45 of the country's 78 major rivers. The Yellow, Huaihe, Taihu, Liaohe, Chaohu, and Dianchi rivers account for 86% of the total number of rivers and lakes in urban areas. The specific chemical pollution is shown in Figure 1. In China, water containing bitter alkali, arsenic, fluoride, and industrial pollution is drunk by up to 65 percent of the population. According to the current statistics, organic chemicals and metals are the main types of water pollutants, the total number of pollutants has reached more than 2000 kinds, and there are 765 kinds of pollutants in the general urban tap water. There are many kinds of water pollutants in China, mainly organic pollution [4, 5].

In the environment, many pollutants are characterized by low water solubility and long degradation time. They can also influence the regional and even global environment through evaporation and condensation through the transport of water and atmosphere. These highly toxic organic pollutants tend to accumulate in the food chain. This type of organic pollutant is called persistent organic pollutants (POPs). The main feature of POPs is that it is difficult to degrade and toxic to bioaccumulate for a long time. POPs can accumulate in entire ecosystems around the globe, and this international migration is mainly through the movement and crossing of species, air, and water. As a result of migration, POPs accumulate in ecosystems far from where they are released and are deposited in areas there. Heavy metals, acid chemicals, and other pollutants have far less harm and impact on the environment than POPs. Carcinogenesis, neurotoxicity, reproductive toxicity endocrine disruption, genetic toxicity, and so on are persistent organic pollutants which can cause harm; medical research has proved that this is a lasting harm over a long period of time. In humans, fertility declines and cancer risk rises sharply. POPs can cause congenital dementia in fetuses and infants, as well as increased rates of stunting and malformation. The reproductive organs that appear in some fish remain underdeveloped. Many animals are found to have male degeneration and high rates of hermaphroditism. POPs with migration and globalization can cause damage to ecological environment, pollution of water resources, and harm to human health [6, 7].

The organic pollution in water can be divided into two kinds according to its source. One is the natural organic matter in the natural ecological environment. Most of this kind of organic matter comes from organisms, such as the matter generated after the death and decay of organisms, metabolites produced by microorganisms, and metabolites produced by animals. The other is synthetic organics, which are mostly man-made chemicals. These include pesticides used in agriculture, synthetic products for commercial use such as pharmaceuticals, plastics, and industrial waste. However, organic matter is a kind of organic matter synthesized by the natural organism, which is transferred to the natural environment in the process of biological metabolism. The natural organic matter in water is not only produced by the metabolism of bacteria, algae, and aquatic plants existing in water but also by metabolic products from terrestrial organisms. Due to the interaction between the natural water cycle and the ecosphere, there are a large number of natural organic compounds from the ecosphere gathered in the natural water system, among which the humus content in the surface water source after the death of organisms accounts for the highest proportion compared with other organic compounds. There are two types of natural organic matter in water; they are divided into hydrophilic organic matter and hydrophobic organic matter. Hydrophobic organics mainly contain aromatic carbon in structure and have phenolic structure and conjugated double bond. Hydrophilic organics are structurally rich in a higher proportion of aliphatic carbon and nitrogen compounds. The complex natural organic matrix may not only change with the change of natural ecological environment but also some organic compounds may react with each other and become more complex. If the natural organic matter in water is too rich, it will not only have a serious impact on domestic water but also its complex enrichment degree will have a great impact on the selection, design, and operation of water treatment process. Of course, the natural organic matter with corrosive effect will also cause difficulties in the operation of industrial facilities [8, 9].

With the development of industrialization, more than 10 million kinds of organic chemical pollutants have been discovered and synthesized artificially. There are a variety of such organisms that enter the environment through various channels. Synthetic organic pollutants often come from light industry, chemicals, and emerging industries such as pharmaceuticals, including pesticides, phenols, and cyanide commonly used in agriculture. Common detergents and residues in all kinds of food synthetic antibiotics and so on. Due to the complex structure, these pollutants are difficult to degrade in the natural environment, resulting in the accumulation of pollutants in the environment, causing great harm to organisms and the environment.

Pesticides mainly refer to chemicals used to control pests in water production and regulate plant growth [10, 11]. In the development of modern society, the use of chemical products has become the most common prevention and control measures because of its advantages of fast, effective, and low cost. According to statistics, the use of chemicals around the world can reduce the losses of various industries by about 30%, thus greatly improving the economic benefits of the society. China is a big industrial country and also a big country in the production and use of chemical products. The wide use of all kinds of chemical pesticides has made great contributions to the development of society and is also an important means to improve economic benefits. According to the statistics of relevant departments, it is estimated that the money spent on the use of chemicals can get four times the profit; it can be seen that chemicals are the most important means of production to ensure the stable production of the industry and the weight of profit. Many industrial production systems now rely on the widespread use of pesticides and other chemicals. Due to the lag of plant protection machinery and application technology in China, most of the chemical drugs are scattered in the soil or floating in the air and other surrounding environment in the process of spraying, while a small part is attached to the leaves of crops. If the concentration of spraying chemicals is too small to effectively kill pests and diseases, but the concentration of spraying chemicals is too large, it will not only produce

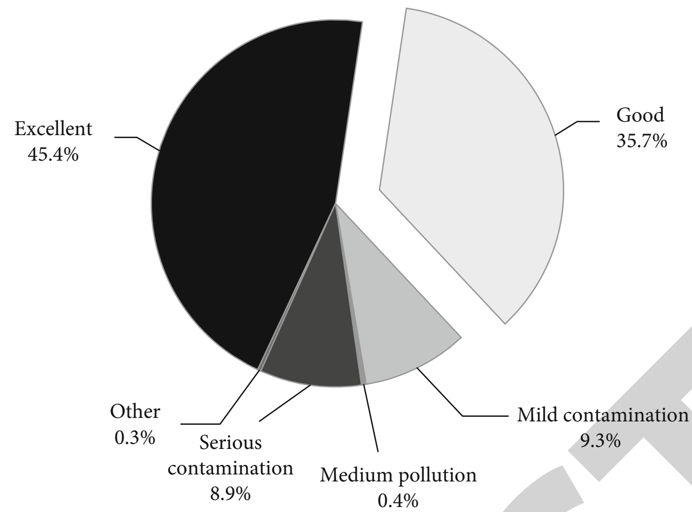

Figure 1: The proportion of different chemical pollutants.

pesticide harm to crops but also pollute the environment and even threaten human health. Therefore, in order to manage chemicals properly, governments have formulated relevant policies to guide the use of chemicals, established appropriate chemical management systems, and determined the maximum concentration of spraying in actual field spraying. Therefore, strengthening the analysis and detection of chemical pollutant concentration is an urgent need to improve economic benefits and protect the ecosystem and human health from possible harm [12, 13].

2. Related Work

The internationally accepted standard method of organic pollutants in water is to roughly predict the pollution level of organic matter in water by analyzing chemical oxygen demand (COD), so as to estimate the degree of chemical oxidation of pollutants in water. Due to the high relative accuracy of COD standard method, environmental supervision departments of various countries have formulated a series of water quality monitoring indicators according to COD standard method. The standard of drinking water in China clearly stipulates that the COD of class I and II water is less than 15 mg/L, the COD of class III water is less than 20 mg/L, the COD of class IV water is less than 30 mg/L, and the COD of class V water is less than 40 mg/L. In addition to these standard methods, some researchers have also proposed the advantages of alkaline potassium permanganate and acid potassium dichromate methods to design a new digestion mode for treating water samples and successfully established a feasible potentiometric titration method. This method can realize the detection of low COD value in daily drinking water. This method has high degradation efficiency, good precision, and low detection limit. Compared with the standard method, this detection method has higher accuracy in the detection of low concentration [14, 15]. Because the single organic pollutants in water generally exist in a small amount in the water environment, it leads to the use of conventional standard indicators such as COD detection which cannot determine the accurate content. Therefore, in the face of some serious chemical pollutants, the country has formulated the corresponding standard for the detection of single organic matter, and many methods for the detection of such substances have emerged. Over the past few decades, a number of techniques have been developed for the determination of contamination concentrations in samples, including conventional detection methods and new types of conventional biosensor analysis methods, which have been effectively applied to the detection of chemical contaminant concentrations. The following focuses on several typical methods for detecting single organic contaminants.

Gas chromatography refers to the chromatography using gas as the mobile phase. Due to the rapid transfer of the sample through the gas phase, the sample components can reach an instant equilibrium between the mobile phase and the stationary phase. In addition, there are many substances that can be selected as stationary phase, so gas chromatography is a separation and analysis method with high analysis speed and high separation efficiency. The experimental results show that this method can reliably detect low concentration of pollutants in strawberry jam, and the detection method has good reproducibility and selectivity. Liquid chromatography is a kind of separation and analysis technology, which is characterized by liquid as mobile phase; stationary phase can be a variety of forms, such as paper, sheet, and packed bed. In pesticide analysis, liquid chromatography is usually combined with UV detection, fluorescence detector, and other techniques. Liquid chromatography has high sensitivity and selectivity [16, 17]. Mass spectrometry is a method that separates moving ions according to their mass to charge ratio by electric field and magnetic field. The composition of ionic compounds can be determined by measuring the exact mass of ions. Mass spectrometry combined with probe sampling has emerged as a new and efficient analytical tool to provide important toxicological information and ensure an appropriate emergency response.

Spectral analysis is a method to identify substances and determine their chemical composition and relative content according to their spectra. It is an analytical method based on molecular and atomic spectroscopy. Electrochemical analysis is a kind of instrumental analysis method based on the electrochemical properties of substances in solution. A method for the determination of a test fluid as a component of a chemical cell based on the relationship between some electrical parameters of the cell (such as resistance, conductance, current, or voltage) and the concentration of the substance to be measured. Microbial analysis and detection method is based on the principle of microbial biological activity to detect the degree of sensitivity; this method can be used to determine some inhibition of microbial growth of antibiotics, toxins, or chemicals and other organic pollutants [18, 19].

In a word, researchers in related fields have been extensively exploring the detection methods of pesticide concentration and achieved fruitful results. However, the detection methods based on chromatography and mass spectrometry are time-consuming and laborious. Spectroscopic analysis requires expensive instruments, time-consuming sample pretreatment, and specialized operators. The electrochemical sensor does not need biological active enzymes and antigen-labeled antibodies, and its operation interface is simple, showing the advantages of high sensitivity and fast in the analysis of trace pesticide concentration, but its application scope is narrow. Photochemistry, which evolved from electrochemistry, is a new discipline to explore the influence of light on photoactive substances. Photochemistry mainly refers to the conversion of light into electricity and the mutual conversion of electric energy and chemical energy. In the 1830s, Bechrer of France discovered that in the presence of light, the electrical signal of the metal electrode attached to silver halide in the electrolyte would change, so he proposed the Bechrer effect [20, 21]. Chemical sensor is a special kind of sensor in modern analytical chemistry. It is composed of induction device (recognition) and transducer (conversion), which is based on the electrochemical activity of the target detection object, through the electrochemical reaction of the target detection object on the induction element (electrode), so as to generate electrical signals. The perceived electrical signal is then recognized and converted and finally displayed on the computer. The response value of the generated electrical signal will increase with the increase of the concentration of the target detection object. The principle of the electrochemical sensor to detect pollutants is that the pollutants of a certain concentration are adsorbed at the electrode interface first, and redox reactions occur under pressurized electrocatalytic conditions. Since the essence of redox reaction is the gain and loss of electrons, the number of gained and lost electrons in the process of this chemical reaction can be accurately captured, macroscopically expressed as the size of current value. Therefore, a quantitative relationship is established between pollutant concentration and electrical signal. At the same time, the electrode can identify different pollutants qualitatively or quantitatively due to the different peak locations of different pollutants [22, 23].

Typical sensor systems are mostly composed of four parts, including xenon lamp as excitation light source system, electrolytic cell as reaction place, electrochemical workstation for collecting and processing electrical signals, and the most important three-electrode system. Analysis and detection substances can directly or indirectly change the properties of photosensitive materials or electrolyte environment, which will affect one of the above processes and then affect the signal generated in the whole PEC detection process. Therefore, in the process of photoelectric chemical analysis, quantitative analysis is generally achieved through the change of signal. Compared with traditional electrochemical sensing, PEC sensing technology combines the advantages of photochemistry and electrochemistry. PEC sensing technology detects signals and excitation signals in different energy forms, which ensures that the two signals are independent of each other and will not interfere in the analysis and detection. Unlike electrochemical sensing, which usually generates signals at specific potentials, PEC sensing reduces the dependence on applied potentials. In addition, compared with spectral detection techniques, which usually involve complex and expensive equipment, the electrical signal mode enables PEC sensing to have the characteristics of simple instrument, low cost, and easy miniaturization. In order to further simplify the PEC sensor system and improve its portability, some scholars have studied two new sensing technologies: self-powered photochemical sensor and photochromic visual sensor. Self-powered electrochemical sensor is a PFC sensing technology based on PEC sensing and combined with the characteristics of self-powered fuel cell, which can realize self-powered analysis and detection of detected objects. This kind of sensor construction method is different from the classical three-electrode electrochemical sensor driven by an external power supply. It adopts a two-electrode system. The other energy is converted into electricity through the reaction of both anode and cathode, so the whole sensing process does not need power supply. Photochromic visual sensor is a new sensing technology combining photochromic devices and photochemical sensors [24, 25]. It uses the characteristics of electrochromic devices that can produce different discoloration effects under different current signals to achieve the purpose of quantitative analysis of detected objects. This technique successfully simplifies the signal output of photoelectric chemical sensing technology from electrochemical workstation to color change.

Although the sensor technology mentioned above has made a lot of research achievements in the field of chemical pollutant concentration detection, these methods have their own limitations and there is no method to study the technology of multisensor fusion. Because multisensor is to fuse and enhance the data of multiple sensors, it can provide more useful information than a single sensor, thus improving the performance of the model. Therefore, in view of these problems, this paper is aimed at developing simple, fast, convenient modification and modification methods, low development cost. An easy and stable method was developed for rapid and sensitive detection of chemical pollutants in water environment. Based on the above discussions, the main contributions of this paper are shown as follows:

(1) This paper is the first time to apply the model based on multisensor to the detection of chemical pollutant concentration and has achieved good performance of the model

(2) The proposed method not only has certain theoretical value but also has wide application prospect

3. Multisensor Fusion-Based Abnormal Concentration Detection of Chemical Pollutants

3.1. Introduction of Multisensor Information Fusion. The concept of multisensor information fusion is derived from interconnection probability information filter to solve the problem of information synthesis in recognition technology. This information processing technology was first used in the military field and made outstanding contributions to the detection of enemy submarines at that time. With the rapid development of information technology, the application scope of multisensor information fusion technology also extends to many aspects of modern society; its emergence has promoted the rapid development of many scientific and engineering fields. The structure of multisensor information fusion can analyze series structure, parallel structure, and series and parallel structure. Here, we take the series-parallel structure as an example to illustrate, as shown in Figure 2. And the sensor is first input into the model. In this figure, one sensor corresponds to one model for simplicity.

This structure contains the characteristics of both serial and parallel structures, which can combine the advantages of the two structures into one system. The method of structure fusion is to locally model the information collected by each sensor. Then, the local modeling results are sent to the fusion center for fusion again, and finally, results are obtained. Its main responsibility is to accept the information data sent by the feature layer and find out the information directly related to the research object and the problem to be solved. According to the actual situation, the appropriate processing algorithm is used to comprehensively process the feature information, analyze, and conclude the final judgment result. Generally, the decision-making of the whole system is based on its results, which directly determines the reliability and effectiveness of the system.

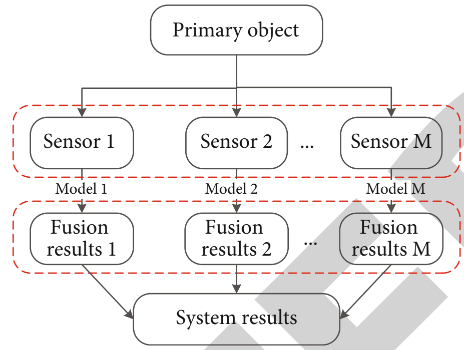

Figure 2: The structure of multisensor information fusion.

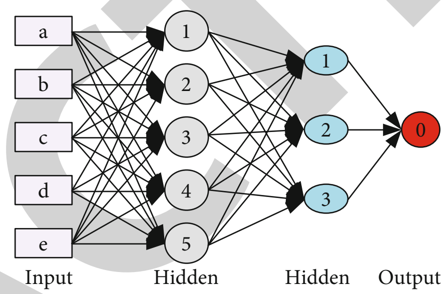

Figure 3: The diagram of multisensor fusion BP neural network.

3.2. Multisensor Fusion-Based BP Neural Network. Generally speaking, the overall structure of BP neural network can be divided into three layers: input layer, hidden layer, and output layer, which is given in Figure 3. The main function of input layer is to input the signal collected from the outside into the whole network for fusion calculation. The input of the multisensor fusion BP neural network is the concentration of chemical contaminants, sampling interval, adoption time, etc. The output layer and hidden layer of BP generally adopt tan and log functions as the activation functions to generate transformation. The advantage of using such activation functions is that these two functions are not linear functions but differentiable functions, and it is easy to obtain partial derivatives by using these two functions in calculation. The neuron nodes in the input layer of the characteristic layer receive the normalized data of temperature and pollutant concentration of the studied environment. Due to the data of pollutants we fused, these signal functions over time are continuous nonlinear functions, and the multilayer structure will only be used when fitting the noncontinuous function, so we adopt the structure of multihidden layers.

There are many structure types of neural network. In view of the complexity and uncertainty existing in the security of smart home, this paper selects the relatively mature BP neural network algorithm to fuse the data information collected by the security detection module as (1), where x is the set of real numbers and $f(x)$ belonged to $[0, 1]$.

$$f(x) = \frac{1}{1 + e^{-x}}. \quad (1)$$

In addition to the above activation function, another common activation functions are as follows: the input of neuron of the jth hidden layer is

$$u_j^J = \sum_{j=1}^{J} \left(\omega_{ij} x_{mi} - \theta_j \right). \quad (2)$$

The output is

$$v_j^J = f\left(u_j^J\right). \quad (3)$$

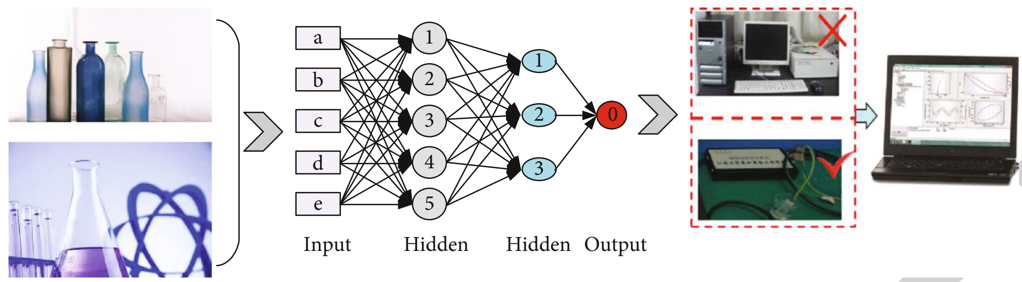

Figure 4: The framework of abnormal concentration detection method of chemical pollutants based on multisensor fusion.

Then, the input of neuron of the kth output layer is

$$u_k^K = \sum_{j=1}^{J} \left(\omega_{jk} v_j^J - \theta_k \right). \tag{4}$$

The output is

$$y_{mk} = v_k^K = f\left(u_k^K\right). \tag{5}$$

Since we assume that the sample is normally distributed, the errors in Formula (6) are normally distributed

$$e_{mk}(n) = t_{mk}(n) - y_{mk}(n). \tag{6}$$

Then, select the next group of input samples, continue the calculation according to the above method, and adjust the parameters. The sum of error energy of the system output layer is

$$E(n) = \frac{1}{2} \sum_{k=1}^{K} e_{mk}^2(n). \tag{7}$$

Then, the propagation of neural network error is opposite to the forward propagation process of neural network system signal, which is propagated from back to front. Therefore, in the error correction process of neural network system, the system will correct the weight and deviation from back to front. In the BP neural network algorithm, the error energy of the expected output is positively correlated with the partial derivative of the weight of the hidden layer and the output layer, i.e.,

$$\frac{\partial E(n)}{\partial \omega_{jk}(n)} = \frac{\partial E(n)}{\partial e_{mk}(n)} \cdot \frac{\partial e_{mk}(n)}{\partial y_{mk}(n)} \cdot \frac{\partial y_{mk}(n)}{\partial u_k^K(n)} \cdot \frac{\partial u_k^K(n)}{\partial \omega_{jk}(n)}. \tag{8}$$

According to the definition of the system and all known relations,

$$\begin{aligned} \frac{\partial E(n)}{\partial e_{mk}(n)} &= e_{mk}(n), \\ \frac{\partial e_{mk}(n)}{\partial y_{mk}(n)} &= -1, \\ \frac{\partial y_{mk}(n)}{\partial u_k^K(n)} &= f'\left(u_k^K(n)\right), \\ \frac{\partial u_k^K(n)}{\partial \omega_{jk}(n)} &= v_j^J(n). \end{aligned} \tag{9}$$

Accordingly, there are

$$\frac{\partial E(n)}{\partial \omega_{jk}(n)} = -e_{jk}(n) \cdot f'\left(u_k^K(n)\right) \cdot v_j^J(n). \tag{10}$$

Based on the above discussions, the framework of abnormal concentration detection method of chemical pollutants based on multisensor fusion proposed in this paper is given in Figure 4. It mainly includes the collection of chemical substances, the establishment of multisensor fusion BP neural network, and the output and analysis of model results.

4. Experimental Results and Analysis

4.1. Experimental Data Introduction. With the rapid development of modern agriculture, chemicals are playing an increasingly important role in actual production. China's chemical varieties, chemical production is large, and the use is increasing year by year. In the use of chemical substances, due to improper spraying or long-term residual in the environment, there is not only food and environment pollution to varying degrees but also harm to human health, so the concentration of chemical pollutant detection and control is particularly important.

Water samples from the surrounding waters of a city were collected, mainly in the urban areas, mainly near the estuary of rivers and sewage outlets. In addition, samples were also collected from several reservoirs in the city to monitor the quality of water sources. A total of 28 sampling sites were set up, and samples were collected in waters 4 m away from the shore with a self-made sampling device. 0.5 L of water samples was collected from the surface water of each sampling site and placed in a brown bottle protected from light. Then, samples were brought back to the

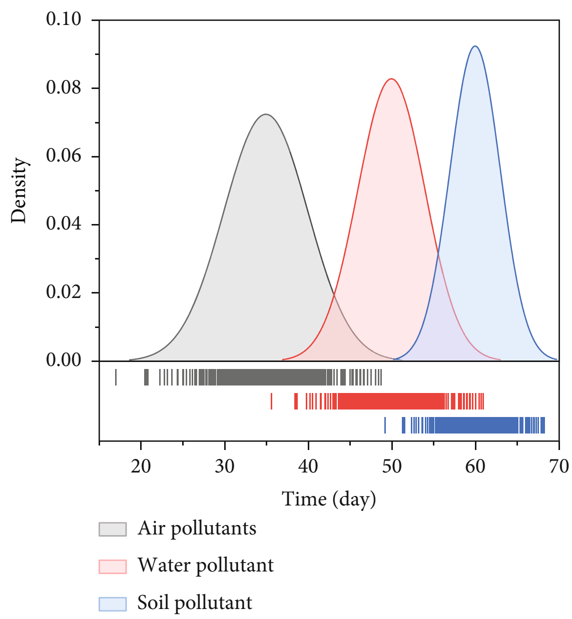

FIGURE 5: The variation of concentration of different kinds of chemical pollutants.

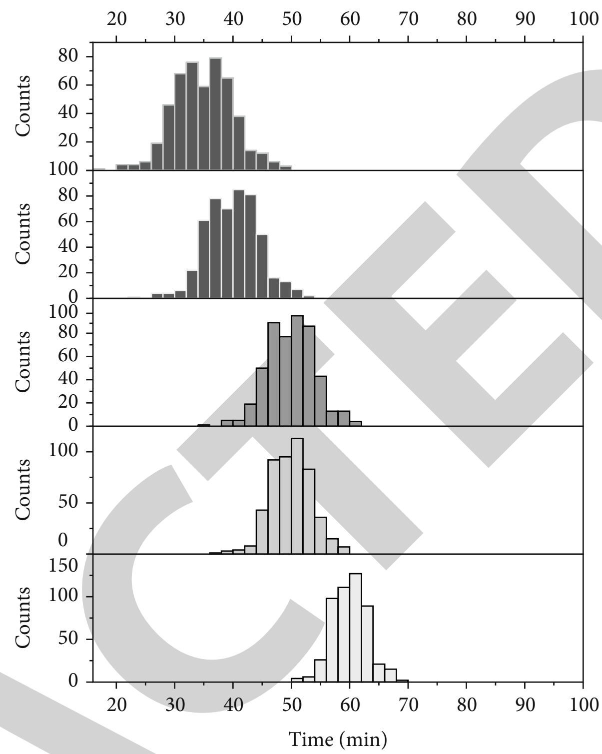

FIGURE 6: Comparison of peaks of different elution gradients.

laboratory at low temperature and stored at 2°C, and the pretreatment of samples was completed within one week.

4.2. Experimental Result Analysis. Before the study, the variation rules of concentration of several typical chemical pollutants (air pollutants, water pollutants, and soil pollutants) are presented, as shown in Figure 5. As can be seen from the figure, although the types of pollutants are different, their concentration changes show a positive distribution pattern of increasing first and then decreasing. The main reason is that at the beginning of the pollution, the concentration of pollutants should not be very high. With the increase of the degree of pollutants, the concentration of pollutants will gradually increase and reach the maximum. Then, due to rain erosion, air circulation, and the volatilization of pollutants, the concentration of pollutants will gradually decrease and reach the minimum value. Although the concentration of chemical pollutants will be reduced for various reasons, if the concentration of pollutants is still reduced under natural conditions, it will not only take a long time but also the pollution caused during this period is unacceptable. Therefore, it is necessary to test the concentration of pollutants manually.

One of the important functions of liquid chromatography is to improve the response value by adjusting the ratio of different organic and inorganic phases for gradient elution and separating the spectral peaks of various target substances and optimizing the peak shape. The results of liquid chromatography analysis of pollutants outputted by BP neural network are shown in Figure 6. As you can see from the figure, the first subgraph uses a high proportion of organic phases. Although the peak time of the target substance is short, it is concentrated within 30~40 min, and the peak overlap is serious, the peak shape is poor, and some target substances have low response values. In the second subgraph, the separation degree of the target object is reduced by increasing the initial organic phase proportion, and the organic phase proportion increases slowly, which slows down the phenomenon of peak overlap of the subsequent target object. The results showed that the peak of the target substance was concentrated in 40~45 min, indicating that the initial organic phase proportion was large and needed to be optimized again. The similar situations can also be seen from the subsequent subgraphs, and it can be seen that the concentration detection effect of chemical pollutants is more and more obvious by the multisensor fusion BP neural network. It is worth noting that the concentration peak time of the three pollutants is not the same, mainly because of the volatilization degree of the three pollutants.

Dilute 20 mg/L mixed standard solution with 20% acetonitrile-80% 0.1% formic acid aqueous solution to 70 μg/L, 55 μg/L, 40 μg/L, 25 μg/L, 10 μg/L, and 0 μg/L step by step to prepare the target pollutant concentration required by the standard curve. The standard curves of some agricultural drug targets obtained are shown in Figure 7. It can be seen from the table that the linear correlation coefficients of 8 pesticide standards are all greater than 0.998, and the detection limits of this method are 0.05 ng/L~0.91 ng/L, indicating that this method has a good linear range, low detection limit, and high sensitivity.

In order to further verify the effectiveness of the proposed method, the detection results of the proposed method at different pollutant concentration levels (10 μg/L, 1000 μg/L, and 1000000 μg/L) are presented, as shown in Figure 8, where the red curve is the true concentration value, and the blue

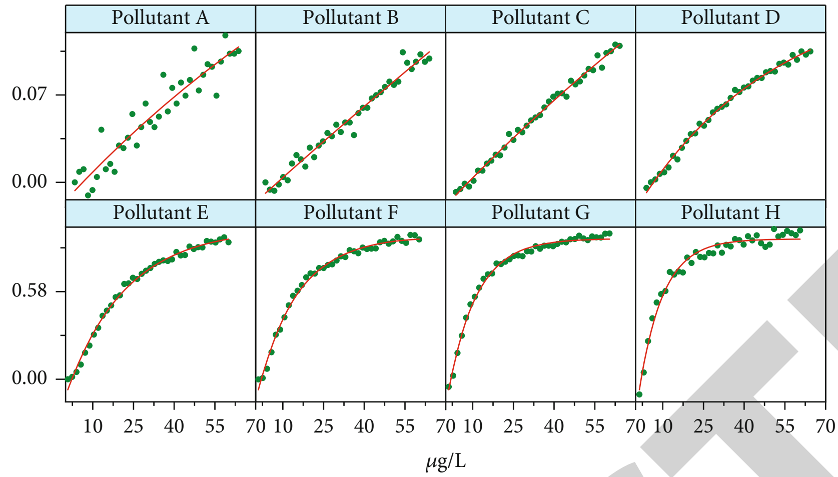

FIGURE 7: Standard curve for partial detection of contaminants.

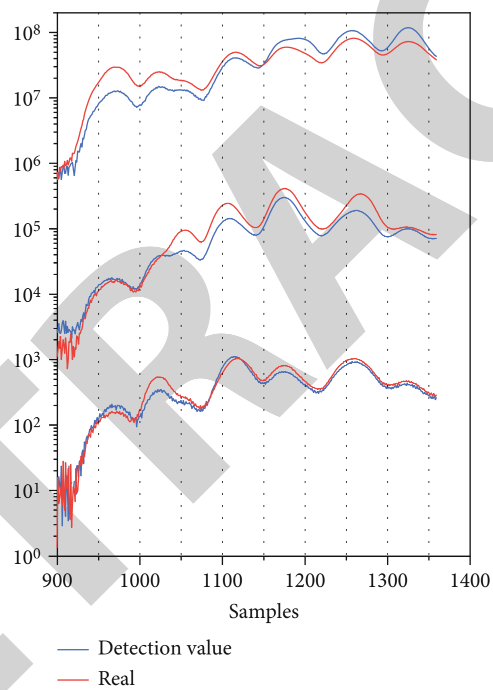

FIGURE 8: The relationship between the true value and the detected value at different concentration levels.

curve is the detected concentration value. As can be seen from the figure, the method presented in this paper can track the concentration change curve of chemical pollutants well with the increase of sample number at different concentrations, which indicates that the method presented in this paper has a good detection effect of pollutant concentration. It is worth noting that the abscissa here is randomly selected in the range of 900 to 1400 as a verification of the method in this paper.

In addition, the method in this paper is also used to detect the concentration of chemical pollutants in natural waters, and the specific results are shown in Figure 9. As can be seen from the figure, the concentration of metolachlor in this method exceeded 50% from January to August, and the highest proportion was 88%. It indicates that metolachlor is the main pollutant in this water region. By contrast, prometryn has a low percentage of no more than 7% in all months, indicating low levels of the pollutant in the water domain. In addition, it can be seen from the figure that butachlor accounts for the second most. In addition, the concentrations of acetochlor and bromacil were similar, that is, they were not the highest in different months. The above results are compared with the local environmental protection test results, and the two results are consistent, thus demonstrating the effectiveness and reliability of the method presented in this paper. It is worth noting that the change of chemical pollutant concentration often takes a long time, so we chose January to August as a representative period.

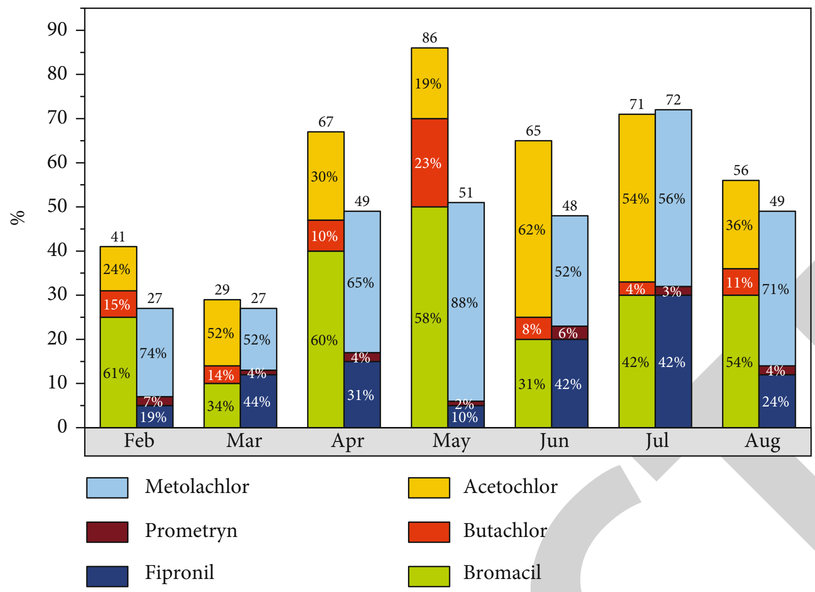

Figure 9: Percentage of total detected pollutants.

5. Conclusions

Chemical pollution is an important problem which needs to be solved urgently in China. It is related to ecological balance and human health. The current work of chemical pollutants in water environment in China is time-consuming, laborious, and complicated.

In view of the shortcomings of existing problems, in this paper, a method for abnormal concentration detection of chemical pollutants based on multisensor fusion is designed. Through simulation and verification, we can see that the system information fusion is feasible. The method not only has good detection accuracy but also can achieve stable model performance. Based on the work done above in this paper, there are still many places to be improved and upgraded. In the future work, we hope to realize the combination of methods and Internet and network the detected signals to achieve remote control and online detection. Although the proposed multisensor fusion method achieves good results, the current method is based on shallow BP neural network, and future research can focus on the multisensor fusion based deep model.

Data Availability

The datasets used during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

The author does not have any possible conflicts of interest.

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