Hindawi
Mobile Information Systems
Volume 2022, Article ID 2772093, 9 pages
https://doi.org/10.1155/2022/2772093

Research Article

Rural Revitalization and Digital Financial Economic Development Model Based on Multimodal Sensor Fusion

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Received 25 April 2022; Accepted 2 June 2022; Published 6 July 2022

Academic Editor: Jiguo Yu

Since the 19th National Congress of the Communist Party of China, the key to rural development has been to solve the problem of rural development. The "three rural issues" is a critical issue for the country's economy. In addition, the implementation of the Rural Revitalization Strategy under the environment of data financial and economic development can be more convenient and efficient. However, the traditional sensor fusion technology still has the disadvantages of low efficiency and high cost in the application of Rural Revitalization and digital financial economic development model. In order to solve the shortcomings of this technology, this paper proposes a multimodal sensor fusion technology combined with BP neural network (BPNN, a commonly used feedback neural network) and Kalman filter (a linear filtering algorithm), and it constructs a rural economic development model combined with digital finance. This paper uses this technology to study the economic development model. Firstly, the research method is to visit and investigate the residents and basic economic situation of a village and then use the economic development model constructed in this paper to carry out the economic analysis of the BPNN model and Kalman filter model. It includes Mohr scatter diagram, economic income, industrial investment, product export, and household consumption. The results show that the Mohr scatter diagram of the village changes from the third quadrant (−0.7, −0.5) to the first quadrant (−0.7, 0.3); the difference between the economic income calculated by the Kalman filter algorithm and BPNN algorithm and the actual value shall not exceed 10%. The rural industrial investment index increased by 56.08, the product export index increased by 30.11, and the household consumption index increased by 13.10. It shows that the economic development model constructed in this paper has achieved good results.

1. Introduction

Rural Revitalization is the fundamental issue of the national economy and the people's livelihood, and digital finance is a new financial service born under the Internet environment. The agricultural system is intricately tied to a country's structure and rural change. Studying the economic development model of Rural Revitalization and digital finance can accelerate the implementation of the Rural Revitalization Strategy. Multimodal sensors are defined by the existence of multiple models or channels, such as visual, auditory, environmental, and physiological signals. By using multimodal sensor fusion technology, we can improve agricultural production efficiency and sales of agricultural products and accelerate the transformation of agriculture and the construction of Rural Revitalization. The key distinction between multimodal sensor fusion and standard sensor fusion is that independent or multiple acquisition methods can be used.

The wide application of digital financial economy has provided great convenience during the epidemic. It is a good way to integrate digital finance into the Rural Revitalization Strategy. Many scholars have conducted relevant research on this. Chen studied how to promote the development of rural economy through live broadcasting in the epidemic environment [1]. Peng studied the resources of rural areas from the perspective of Rural Revitalization. Relying on the rich local agricultural and sports leisure resources, he promoted the rural economic and cultural construction and introduced a scientific and reasonable integration mechanism. It systematically analyzes the objectives, contents, and methods of the combination of ecological tea garden and leisure sports, as well as the design of coordination, transmission, and matching mechanism for the construction and development of tea bases. It aims to build a sports leisure town [2]. Wasserbacher and Spindler introduced machine learning methods for financial forecasting, planning, and analysis (FPA) to analyze models of economic development. Machine learning seems to be very suitable for supporting FPA by extracting information from a large amount of data with high automation [3]. Aisaiti et al. investigated and understood China farmers' financing intentions for Inclusive Finance, integrated the embeddedness of social enterprises and digital finance into conceptual models, and further studied its regulatory role. Digital finance can greatly improve the positive correlation as a corrective factor [4]. Igor discussed the theoretical problems of regional evaluation of independent development under the condition of digital economy. He also introduced the indicators and strategic objectives of digital economy development in rural areas [5]. Briglauer et al. found that increasing the broadband coverage can protect rural areas from population decline [6]. Arslan et al. created a food system index (FSI). The index looks at how food systems, structures, and rural change are linked. They used the index to analyze the impact of extensive development interventions such as finance and digital connectivity on the development of rural economy [7]. Although these studies have promoted the application of digital finance in Rural Revitalization Strategy to a certain extent, the effect is not ideal in today's epidemic environment.

In order to promote the development of the Rural Revitalization Strategy in the epidemic environment, the traditional data financial economy model needs to be improved. Therefore, some scholars propose to use sensor fusion technology to develop rural digital financial economy. Among them, Qiu et al. proposed the fusion method of multimodal and multiposition sensors [8]. Foot-and-mouth disease (FMD) is a disease that affects humans. Basavarajaiah aimed to fit sensor fusion noise estimation through snapshot technology to reduce high-dimensional large-scale real-life FMD data sets [9]. Zhu et al. proposed a new algorithm for dynamic model recognition. Zhu et al. gave the centralized fusion method of all least squares and deduced the multisensor recursive fusion algorithm under the framework of all least squares [10]. Le et al. studied the recognition method based on multisensor signal fusion technology from the three-dimensional direction [11]. Bhilare et al. introduced the design, fabrication, and characterization of multimode sensors with integrated stretchable tortuous interconnections. Bhilare et al. proved that, using the established PCB manufacturing technology, laser processing, and sheet metal forming methods, the integrated multimode sensor can be used to convert the common flexible printed circuit board (PCB) basic materials into stretchable circuits [12]. Although the above research mentioned the use of sensor fusion technology to improve the development model of rural digital finance, they all lack comprehensive understanding, and these methods still have the problems of unclear effect and high cost.

This paper uses the method of multimodal sensor fusion to design a development model of Rural Revitalization and digital financial economy. It also uses an artificial neural network and Kalman filter model to test the actual effect of this method on the economic development of rural digital finance. The results show that the Mohr scatter diagram of the village changes from the third quadrant (−0.7, −0.5) to the first quadrant (−0.7, 0.3). Moran scatter chart is used to understand the aggregation degree of digital finance in the region, which changes from the third quadrant to the first quadrant, indicating that the aggregation degree of digital finance in the village has been significantly improved. Compared with the economic income calculated by the Kalman filter algorithm and BPNN algorithm, the calculated difference in 2019 is the largest, but not more than 2 million yuan, which is no more than 10% compared with the actual value of 20.752 million yuan. It shows that the calculation error of the two models is small. The percentage of economic difference between rural per capita income and urban per capita income decreased from 43.04% in 2017 to 16.03% in 2021, showing a sharp decline curve, indicating that the economic development speed of the village has been improved. The innovation of this paper is to creatively propose a method to promote the revitalization of rural areas and the development of digital financial economy by using multimodal sensor fusion technology. Through the prediction and comparison between the Kalman filter model and the neural network model, the results are more intuitive and reliable.

2. Economic Development Model Based on Multimodal Sensor Fusion

2.1. Construction of the Economic Development Model. Wearable sensors are another area where multimodal sensors may be used. Researchers employed wearable sensors put at various spots on the human body to recognize various everyday activities in the beginning. However, due to the reduced cost, smaller size, and increased privacy of many sensors included in smartphone devices in recent years, researchers have begun to pay greater attention to smartphone sensors. Gyroscopes, GPS, accelerometers, microphones, gravity sensors, magnetometers, and other smartphone sensors are examples. The majority of prior research on behavior identification using cellphones was done offline using various machine learning methods; however, there has been a trend toward online recognition in recent years. Data acquisition, preprocessing, and classification processes can all be done locally on the smartphone with online behavior recognition, and in some cases, online behavior recognition, feature extraction, and classification processes are performed on a remote server or cloud with online behavior recognition.

Sensor-based behavior identification systems have been effectively implemented in the sectors of medical diagnostics, smart homes, sports, and leisure and have attracted a lot of interest from academics and the general public. In the field of medical diagnosis, for example, the use of intelligent equipment systems can transform a clinical setting into a treatment environment based on patients or patients' families, and continuous physiological monitoring can be performed under any conditions, reducing patient hospitalization time and improving diagnostic accuracy. In terms of smart homes, assisted living systems are used to give supervision or help to inhabitants, protect their safety and health, and provide services such as fall monitoring and safety assurance; in sports and recreation, wearable sensors, on the other hand, can be utilized for sports video annotation, sporting events, and other commercial operations. A vast amount of multimodal sensor data is created on a regular basis, and how to interpret this data efficiently has become a key problem among academics. At the moment, multimodal sensor behavior recognition research is still in its infancy, and the majority of data feature extraction approaches are done manually.

The overall architecture of multimodal sensor fusion (the integration or fusion of two or more biometric technologies is referred to as multimodality) used in this paper is shown in Figure 1. In the figure, video, image, voice, and text are recognized and classified by the neural network model and Kalman filter model, respectively. Then, the data are fused into the visual memory network and text memory network through the homogenization pool, and finally, the output results are connected and Softmax logistic regression. An extension of the logistic regression model is the Softmax logistic regression model.

The development model of Rural Revitalization and digital financial economy constructed in this paper is shown in Figure 2. According to the Rural Revitalization Strategy, it is divided into ecological environment construction, governance structure upgrading, road transportation system improvement, cultural heritage inheritance, industrial infrastructure construction, model reform and innovation, public facilities construction, and rural style construction. Each aspect is subdivided into several strategic measures. For example, industrial infrastructure construction is divided into agricultural industry construction, cultural tourism industry construction, health industry construction, and so on. In addition, this paper carries out Rural Revitalization construction combined with digital financial economy. It includes rural Taobao, online bank loans, mobile payment, and other digital financial methods to facilitate the people and drive the rural economy at the same time. It provides a guarantee platform for rural residents to move towards prosperity.

Digital finance is a financial development model in which the Internet and information technology are applied to traditional financial services. Financial institutions and Internet enterprises combine information technology with financial services such as payment and settlement, credit, savings, investment, and insurance. It has an impact on the traditional financial model. Many innovative financial products facilitate the provision of financial services. Under the fierce market competition, differentiated products can meet the different needs of customers. By using big data to improve the risk control system, it alleviates the problems of information asymmetry and risk ethics and comprehensively improves the risk control ability of finance [13, 14].

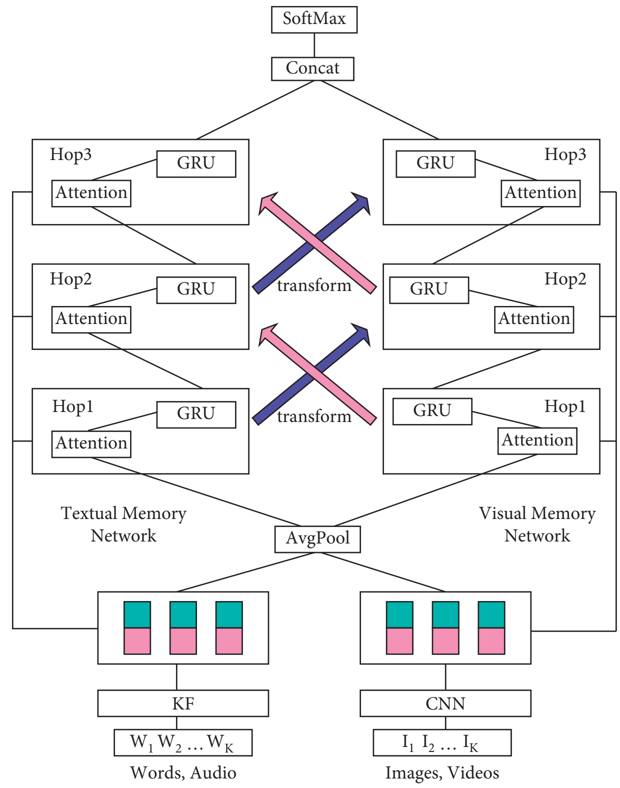

Figure 1: Multimodal sensor fusion architecture.

Digital finance is inclusive, which is the supplement and important development direction of Inclusive Finance. Inclusive Finance is committed to solving the constraints of people's inability to participate in the financial sector and providing solutions, especially providing financial services to groups that have been excluded from finance for a long time. For example, it provides special credit for small and microenterprises and establishes small and microenterprises and specialized branches for agriculture, rural areas, and farmers, which makes financial services benefit everyone and promote the balanced development of the financial system. In recent years, Inclusive Finance has developed well under the promotion of policies [15], but the problems of financing difficulties of small and microenterprises and difficult access to financial services in rural areas have not been improved. The imbalance of Inclusive Finance can be attributed to the asymmetry between supply and demand of financial services. Financial service providers pay attention to short-term interests and lack of awareness of long-term service investment in rural areas, and the supply side does not realize the balance between urban and rural financial development. Similarly, for the demand side, the financial quality is weak, and the economic scale is small. Therefore, the imbalance between supply and demand requires suppliers to improve customers' awareness of investment and risk management on the basis of sustainable business development. At the same time, under the background of the information age, it innovates the financial service model with the help of information technology [16, 17].

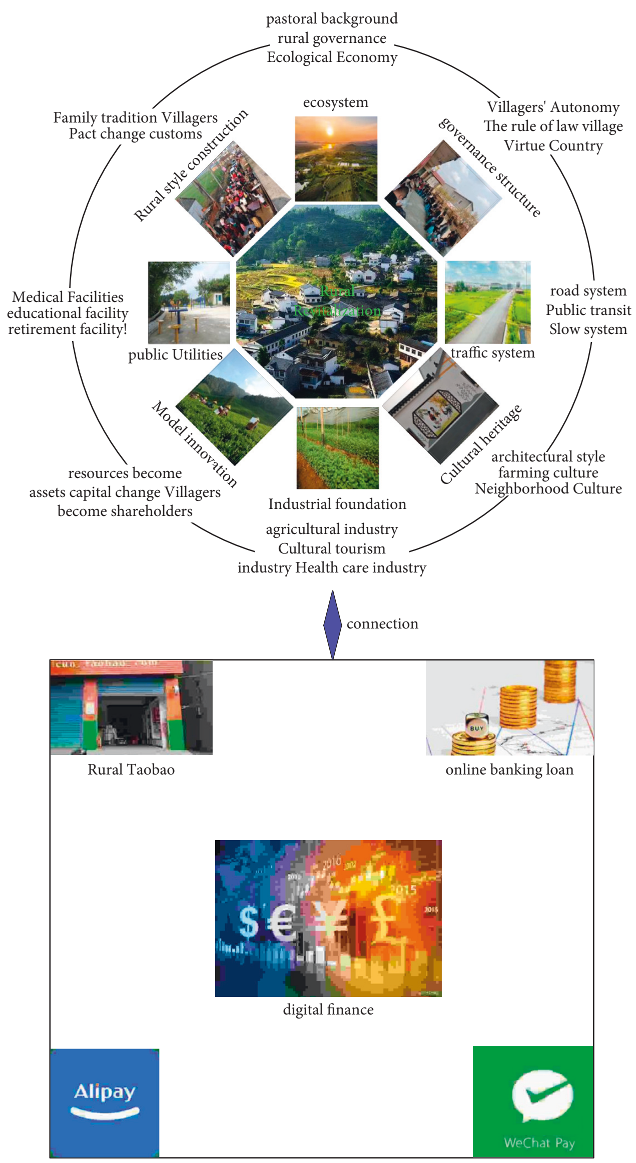

Figure 2: Rural Revitalization and the development model of digital financial economy.

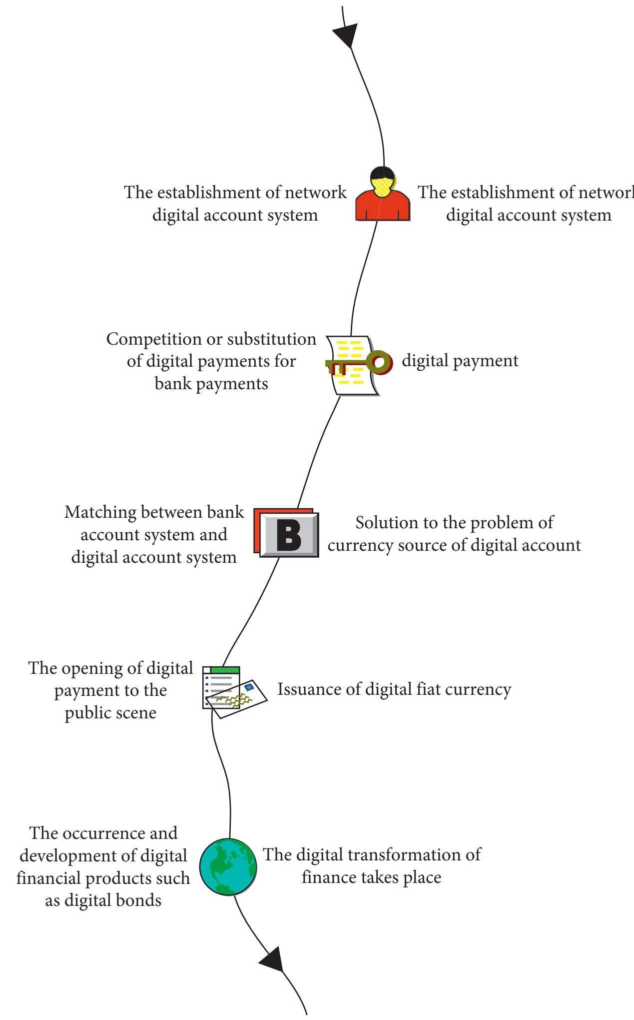

Figure 3: Digital finance industry roadmap.

For the industrial development of digital finance, its roadmap can be shown in Figure 3. To develop the digital financial industry, we must first establish a digital account system and then have a digital payment method. In addition, it should ensure that the digital account system matches the banking system, issue digital currency according to laws and regulations, and finally manage and improve the development of financial products such as digital debt [18].

The specific reasons for the failure of rural financial and economic development are as follows: long space distance, backward infrastructure in rural areas, and few physical outlets of banking financial institutions. It is difficult to maintain a sustainable operation due to large time constraints. Financial services are insufficient, and the income of residents in rural areas is unstable. Compared with urban deposits and savings, banks are difficult to achieve economies of scale. The fixed cost of daily operation makes banks less inclined to rural resources. The contradiction between financial service efficiency and social resource equity leads to market failure and insufficient services. The ability of customers is insufficient, and the rural credit investigation system is not perfect. It is difficult for farmers to provide materials to prove their credit and repayment ability. The group's incomplete cognition of financial services, distrust of financial business, and low recognition of financial fraud may lead to the absence of financial services [19].

The development of digital finance has played an important role in solving the above problems of Inclusive Finance. Digital finance relies on information technology and breaks the constraints of time and space. Financial services can realize the function of resource allocation with new modes, organizational forms, and business processes. It reduces the operating costs of the outlets of physical financial institutions. It reaches rural areas with the advantages of low cost, wide coverage, and high efficiency. Digital finance improves the value preservation and appreciation of rural residents' assets through financial innovative products and optimizes the allocation of market resources. It allows rural areas that have long been excluded from financial development to enjoy diversified financial services and improve the objectivity and rationality of financial services. The development of digital finance has lowered the threshold of various financial transactions and improved the personal credit investigation system and credit risk management mechanism. It improves the participation of the digital inclusive financial market and improves the humanization and initiative of financial services, and many ordinary people can also participate in it [20].

2.2. BPNN Algorithm. BPNN is a widely used feedforward neural network, and its neural structure is shown in Figure 4. In this paper, it can be used for intelligent identification, analysis, and processing of multimodal information. And the Kalman filter algorithm is used to filter the data transmitted by the multimodal sensors.

The net output of neuron I can be expressed as

$$\mathrm{Net}_{\mathrm{in}} = \sum_{i=1}^{n} \omega_i \cdot x_i. \tag{1}$$

Using the S-type activation function, the output can be obtained:

$$y_i = f\left(\mathrm{Net}_{\mathrm{in}} - \theta_j\right). \tag{2}$$

θ_j is the threshold and its weight is −1; then,

$$y_i = f\left(\sum_{i=0}^{n} \omega_i \cdot x_i\right). \tag{3}$$

In the training process, set the training output as $y_i^{k'}$; then,

$$y_i^{k'} = f\left(\beta_i - \theta_i\right). \tag{4}$$

The prediction error can be obtained by the least square method:

$$E_k = \frac{1}{2}\sum_{j=1}^{l}\left(y_i^{k'} - y_i^{k}\right)^2. \tag{5}$$

It adjusts the parameters according to the error:

$$\mathrm{Param}+ = \eta \frac{\partial E_k}{\partial \mathrm{Param}}. \tag{6}$$

Its adjustment weight is

$$\Delta\omega_{hj} = -\eta \frac{\partial E_k}{\partial \omega_{hj}}. \tag{7}$$

For input to hide, the output is

$$\alpha_h = \sum_{i=1}^{d} v_{ih} \cdot x_i. \tag{8}$$

After activating the function,

$$b_h = f\left(\alpha_h - \gamma_h\right). \tag{9}$$

From hidden layer to output layer,

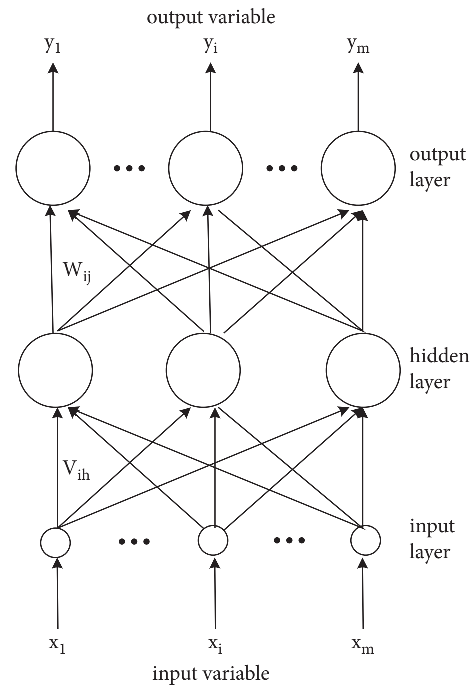

Figure 4: Structure diagram of BPNN.

$$\beta_j = \sum_{h=1}^{q} \omega_{hj} \cdot b_h. \tag{10}$$

The expression of the activation function is

$$f(x) = \frac{1}{1 + e^{-x}} \cdots f'(x). \tag{11}$$

To sum up,

$$\begin{aligned} \Delta\omega_{hj} &= -\eta \frac{\partial E_k}{\partial \omega_{hj}} \\ &= -\eta\left(y_i^{k'} - y_i^{k}\right) \cdot y_i^{k'}\left(1 - y_i^{k'}\right). \end{aligned} \tag{12}$$

Similarly,

$$\begin{aligned} \Delta\theta_j &= -\eta \frac{\partial E_k}{\partial \theta_j}, \\ \Delta v_{ih} &= -\eta e_h x_i, \\ \Delta\gamma_h &= \eta e_h. \end{aligned} \tag{13}$$

3. Simulation Test

3.1. Data Acquisition and Index Determination. Using the development model of Rural Revitalization and the digital financial economy constructed above, this paper makes data statistics and analysis on the actual economic promotion effect of a village according to the time series relationship. First of all, the author visited and investigated the actual situation of the village in 2017. The survey contents include the total population, the number of rural workers, and the source of income, as shown in Table 1.

Table 1: Basic information of rural survey.

Survey item number	Survey content	Finding
1	Population measurement	3215
2	Number of people working	1063
3	Monthly income per capita	2738
4	Total rural economic income	7.838 million yuan
5	Villagers' per capita monthly consumption	2106

Table 2: Rural characteristic resources.

Resource number	Featured resources
S1	Tea
S2	Historical buildings
S3	Local drama
S4	Featured hand weaving
S5	Coal mine

Table 3: Applied digital financial economy.

Code	Detail
E1	Mobile payment
E2	Internet banking services
E3	Rural Taobao
E4	Network fund

Table 4: Selected data indicators.

Code	Index
I1	Moran scatter value
I2	GDP
I3	Industrial investment index
I4	Economic export index
I5	Consumption index

In addition, this paper also investigated the characteristic resources of the village, as shown in Table 2.

The specific digital finance applied in this paper is shown in Table 3.

Finally, the data indicators selected in this paper are shown in Table 4. Among them, the troika representing the economy, namely, investment, consumption, and export, is the main index of data analysis. And it compares the rural and urban economic development so as to more intuitively understand the rural economic development.

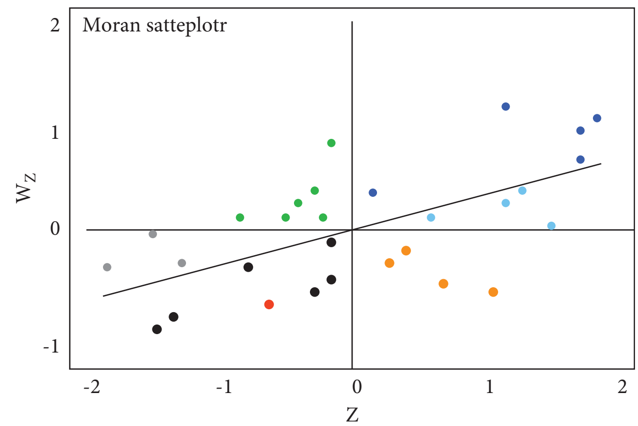

Figure 5: Moran scatter map of the village and nearby areas in 2017.

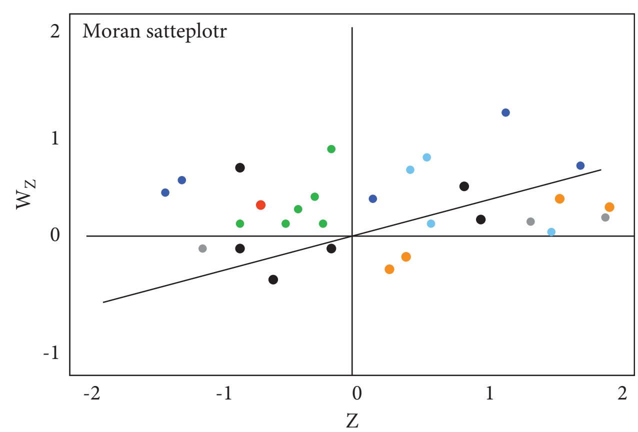

Figure 6: Moran scatter map of the village and nearby areas in 2021.

3.2. Experimental Results

3.2.1. Moran Scatter Analysis. According to the relevant public data collected on the Internet, this paper obtains the Moran scatter map of the village and nearby areas in 2017 and 2021, as shown in Figures 5 and 6. Moran scatter chart is used to understand the aggregation degree of digital finance in this region, in which the abscissa represents the variable region, the ordinate represents the aggregation degree, and the slope represents the Moran index. A plus or minus sign indicates that the correlation is positive or negative. Different initial colors represent the digital financial aggregation degree of different regions. The same color indicates areas in the same quadrant and Moran index interval. The red dot indicates the rural area selected in this paper. In addition, the areas in the first quadrant represent areas with high digital financial aggregation, and the areas in the second quadrant represent areas with high partial aggregation and low surrounding aggregation. Those in the third quadrant represent areas with low aggregation, while those in the fourth quadrant represent some areas with low aggregation and high surrounding aggregation.

As can be seen from Figure 5, the red rural areas selected in 2017 are areas with low aggregation. The coordinates in the figure are roughly (−0.7, −0.5). Choosing rural areas with

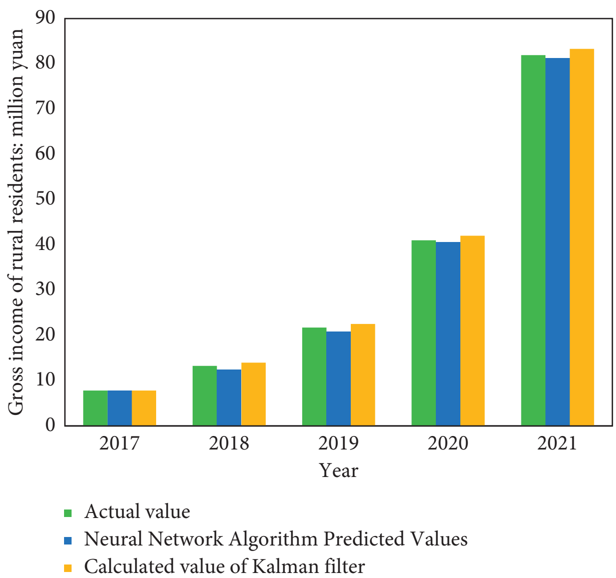

FIGURE 7: Comparison of rural total economic income between KF and CNN algorithm.

low aggregation is more conducive to observing the benefits brought by the implementation of the economic development model constructed in this paper.

As can be seen from Figure 6, after five years of digital financial and economic development, the Moran scatter in the village has changed from the third quadrant with low aggregation in 2017 to the first quadrant with high aggregation in 2021. It also drives the periphery from the area with a low aggregation degree to the area with a higher aggregation degree. At this time, its coordinates in the figure become (−0.7, 0.3). Therefore, it can be explained that the method based on multimodal sensor fusion in this paper can promote the development of rural digital financial economy.

3.2.2. Economic Income Analysis. This paper analyzes the economic development of multimodal sensor fusion in the village for five years. By comparing the Kalman filter algorithm and BPNN algorithm mentioned in this paper with the actual income value, the results are shown in Figure 7. The actual value comes from the annual relevant financial information report of the township government.

As can be seen from Figure 7, after the development of the economic model constructed in this paper, the total economic income of the village has increased year by year. Compared with the Kalman filter algorithm, the calculated value is always smaller than the actual value. It may be because the filter coefficient adjustment is not accurate enough, resulting in the reduction of the amount of data. For BPNN, the predicted value is always larger than the actual value, which may be due to the small weight adjustment coefficient and repeated calculation, resulting in the increase of the amount of data. The calculated difference in 2019 is the largest, but not more than 2 million yuan, which is no more than 10% compared with the actual value of 20.752 million yuan.

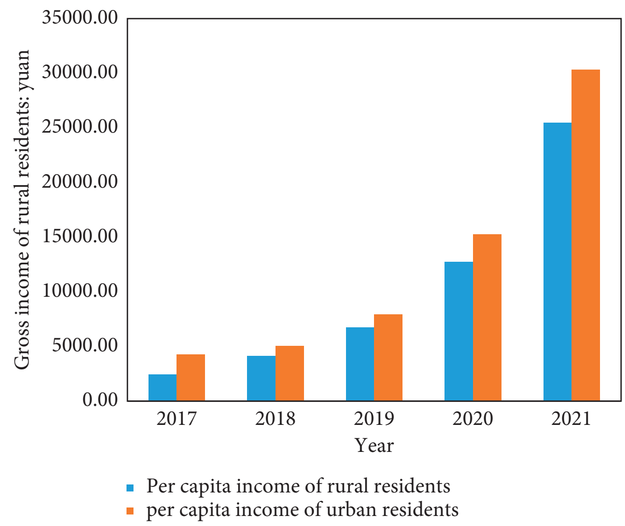

FIGURE 8: Comparison of per capita income between urban and rural residents.

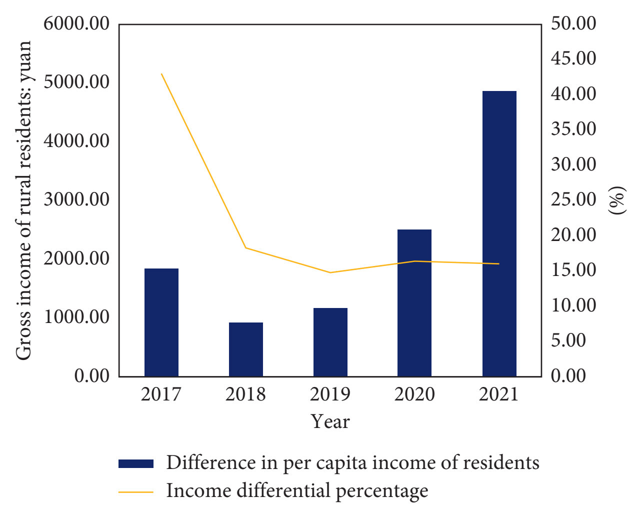

FIGURE 9: Analysis of the difference between urban and rural per capita income.

As can be seen from Figure 8, because digital finance has not been vigorously implemented, the urban-rural income gap in the village is still increasing in value from 2017 to 2021. However, as can be seen from Figure 9, the percentage of economic difference shows a sharp decline from 43.04% in 2017 to 16.03% in 2021. It shows that the difference between the rural economic growth and the urban economic growth is shrinking. This is because, with the promotion of the digital financial economic development model constructed in this paper, the economic development speed of the village has been improved.

3.2.3. Economic "Troika" Changes. Finally, according to the annual financial report of the township government, this paper understands the economic development of the village in the recent five years, as shown in Figure 10. It can be seen from the figure that, from 2017 to 2021, the development of

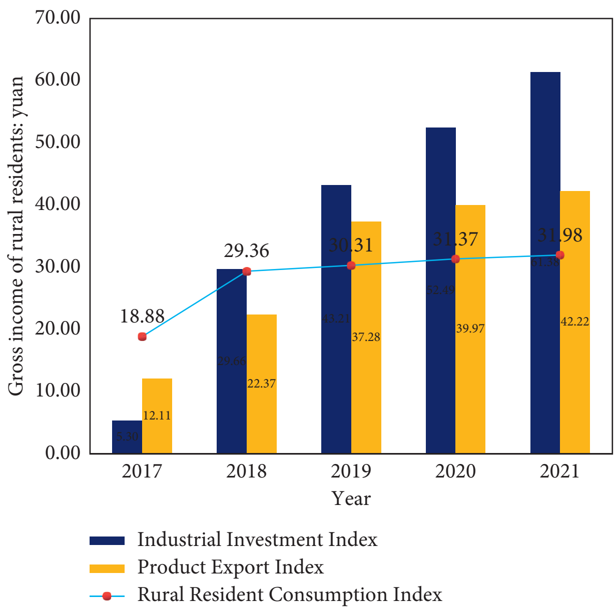

Figure 10: Changes in rural industrial investment, product export, and household consumption index.

the industry was stimulated by online banking loans. The industrial investment index of the village increased from 5.30 to 61.38, and the economic investment increased significantly. Thanks to the promotion of digital finance such as webcast, online sales, and rural Taobao, the product export index rose from 12.11 to 42.22, and the products also got more sales. In addition, as residents have more sources of income, they are bound to have more consumption opportunities. The indicated resident consumption index rose from 18.88 to 31.98. This also shows that the quality of life of rural residents has been significantly improved, and the consumption level has continued to improve.

4. Conclusion

Through the analysis of the economic development model of digital finance constructed in this paper, it is known that the Moran scatter point in the village has changed significantly from the original oligomeric digital finance to a high concentration from 2017 to 2021. From the analysis of the economic income comparison chart, it is concluded that the difference between the predicted value and the actual value by using the Kalman filter and BPNN model is very small, and the difference is no more than 10%. From the analysis of the change diagram of the economic "troika," we can see that the industrial investment index of the village is increasing year by year, the product export index is also rising, and the resident consumption index is also growing. This shows that the Rural Revitalization and digital financial economic development model based on multimodal sensor fusion constructed in this paper has achieved good results. Regarding future work, in terms of model setting, for the comprehensive consideration of the trend analysis of dependent variables and the significance of model results, the model uses the fixed effect model of individual fixation. The double fixed effect model needs to be improved. In terms of data selection, the sample is based on a single rural panel data. Due to the limited level of the author and the difficulty of data collection, the factors affecting the consumption of urban and rural residents cannot be analyzed from the microperspective of household information. In terms of the endogeneity of the model, it is not easy to have endogeneity problems in function form, sample selection, and measurement error. The development of digital finance promotes residents' consumption, and residents' consumption demand reacts to the development of digital finance. There is a causal relationship between the two. In turn, it will cause the endogeneity of the model. One of the main reasons for endogeneity is the existence of missing variables. Therefore, it also needs to control the relevant variables as much as possible, and it uses the endogenous spatial lag term to analyze the space of the explained variables in the adjacent areas.

Data Availability

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

Conflicts of Interest

The author declares no conflicts of interest.

Acknowledgments

This research study was sponsored by the "On the Development Model of Health Care Industry in Southern Shaanxi from the Perspective of Industrial Integration" Project from Education Department of Shaanxi Provincial Government (Project no. 20JK0001) and the "Exploration and Practice of Modern Rural Construction of "Harmonious Coexistence between Man and Mountain" in Qinba Mountain Area" Project from China Construction Bank (Project no. 20210716HZ001). The author acknowledges these projects for supporting this paper.

References

[1] C. Linlin, "Driving factors, effect analysis and countermeasures of the development of China's live broadcast platform," *China Finance and Economic Review*, vol. 10, no. 1, pp. 102–116, 2021.

[2] Y. Peng, "Study on the path of building a sports and leisure town with 10, 000 mu ecological tea garden in western hunan under the background of rural revitalization," *Modern Economics & Management Forum*, vol. 3, no. 1, pp. 1–5, 2022.

[3] H. Wasserbacher and M. Spindler, "Machine learning for financial forecasting, planning and analysis: recent developments and pitfalls," *Digital Finance*, vol. 4, no. 1, pp. 63–88, 2021.

[4] G. Aisaiti, L. Liu, J. Xie, and J. Yang, "An empirical analysis of rural farmers' financing intention of inclusive finance in China: the moderating role of digital finance and social enterprise embeddedness," *Industrial Management and Data Systems*, vol. 119, no. 7, pp. 1535–1563, 2019.

[5] I. Aleksandrov, A. Burmistrov, O. Rasskazova, and M. Fedorova, "Self-development of rural areas under digital economy conditions as exemplified by Northwestern Federal District regions," *IOP Conference Series: Materials Science and Engineering*, vol. 497, no. 1, Article ID 012003, 2019.

[6] W. Briglauer, N. S. Duerr, O. Falck, and K. Hüschelrath, "Does state aid for broadband deployment in rural areas close the digital and economic divide?" *Information Economics and Policy*, vol. 46, pp. 68–85, 2019.

[7] A. Arslan, R. Cavatassi, and M. Hossain, "Food systems and structural and rural transformation: a quantitative synthesis for low and middle-income countries," *Food Security*, vol. 14, no. 1, pp. 293–320, 2021.

[8] S. Qiu, H. Zhao, N. Jiang et al., "Multi-sensor information fusion based on machine learning for real applications in human activity recognition: state-of-the-art and research challenges," *Information Fusion*, vol. 80, pp. 241–265, 2022.

[9] B. D. Basavarajaiah, "Sensor fusion for normally distributed noise estimation by snapshots techniques using foot and mouth diseases massive data sets in Karnataka state," *International Journal of Agricultural Science and Research*, vol. 8, no. 2, pp. 121–130, 2018.

[10] H. K. Zhu, Y. H. Guo, J. M. Mou, and F. Hu, "Dynamics model identification of underwater vehicles based on the multi-sensor fusion of recursive total least squares," *Chuan Bo Li Xue/Journal of Ship Mechanics*, vol. 21, no. 10, pp. 1263–1270, 2017.

[11] J. Le, H. Zhang, M. Le, and L. Hu, "Research on identification of the corner point of 90° weld based on multi-sensor signal fusion technology," *International Journal of Advanced Manufacturing Technology*, vol. 107, no. 5-6, pp. 2277–2290, 2020.

[12] S. Bhilare, G. Jaswal, V. Kanhangad, and A. Nigam, "Single-sensor hand-vein multimodal biometric recognition using multiscale deep pyramidal approach," *Machine Vision and Applications*, vol. 29, no. 8, pp. 1269–1286, 2018.

[13] S. Din, W. Xu, L. K. Cheng, and S. Dirven, "A stretchable multimodal sensor for soft robotic applications," *IEEE Sensors Journal*, vol. 17, no. 17, pp. 5678–5686, 2017.

[14] S. Wang, W. Yu, and X. Yao, "A new regression modeling method for thermal error of numerical control machine tool based on multi-sensor fusion," *Chinese Journal of Sensors and Actuators*, vol. 31, no. 12, pp. 1869–1875, 2018.

[15] G. Lin, "Statistical forecast model and economic analysis of tax revenue based on the fusion of combined forecast model," *IPPTA: Quarterly Journal of Indian Pulp and Paper Technical - A*, vol. 30, no. 4, pp. 731–736, 2018.

[16] X. Fang, K. Paynabar, and N. Gebraeel, "Multistream sensor fusion-based prognostics model for systems with single failure modes," *Reliability Engineering & System Safety*, vol. 159, pp. 322–331, 2017.

[17] R. R. de Oliveira, C. Avila, R. Bourne, F. Muller, and A. de Juan, "Data fusion strategies to combine sensor and multivariate model outputs for multivariate statistical process control," *Analytical and Bioanalytical Chemistry*, vol. 412, no. 9, pp. 2151–2163, 2020.

[18] V. Tkachenko, A. Kwilinski, M. Klymchuk, and I. Tkachenko, "The economic-mathematical development of buildings construction model optimization on the basis of digital economy," *Management Systems in Production Engineering*, vol. 27, no. 2, pp. 119–123, 2019.

[19] W. Choi, H. Tho, Y. Kim, S. Hwang, and D. Kang, "The economic benefits of big science R&D: with a focus on fusion R&D program in Korea," *Fusion Engineering and Design*, vol. 124, pp. 1263–1268, 2017.

[20] J. R. Singh and A. Sanvalia, "Effect of AR (2) model on the economic design mean chart with known coefficient of variation under non normal population," *International Journal Of Computer Sciences And Engineering*, vol. 5, no. 10, pp. 153–169, 2017.