Retraction

Retracted: The Application of Edge Computing Technology in the Collaborative Optimization of Intelligent Transportation System Based on Information Physical Fusion

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SPECIAL SECTION ON GIGAPIXEL PANORAMIC VIDEO WITH VIRTUAL REALITY

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The Application of Edge Computing Technology in the Collaborative Optimization of Intelligent Transportation System Based on Information Physical Fusion

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ABSTRACT Edge computing technology is an important computer operating system in China. It plays a key role in multi-system fusion and intelligent manufacturing, and can play a key role in training and testing of deep neural networks. The purpose of this paper is to study the application of edge computing technology in the collaborative optimization of intelligent transportation systems based on information and physical fusion. This article sets up monitoring points at different traffic intersections, and applies long-term and short-term memory networks to collect data at each traffic intersection. The DBN-SVR method model was used to detect the traffic flow of some intersections, and the edge computer technology was used to process the information signals generated by the intersections. The other portions of the intersections used traditional monitoring systems. By comparing the work efficiency and utility under the two methods, fitting data is performed, and mathematical statistics and mathematical analysis methods are used to verify the fitted data. The experimental data show that the edge computing technology can help the processing of traffic conditions in the intelligent transportation system integrated with information and physics, which has greatly improved the overall work efficiency of each system. Experimental data shows that intelligent transportation systems that integrate edge computing technology with information physics have improved transportation efficiency by about 20% and urban security by about 35%, which has a great effect on building smart cities and safe cities.

INDEX TERMS Edge computing technology, intelligent transportation system, information physical fusion, collaborative optimization.

I. INTRODUCTION

Edge computing is a new type of computing model that performs calculations at the edge of the network. The edge of edge computing refers to any computing resource and network resource from the data source to the cloud computing center. The objects for edge computing include uplink data from the Internet of Things and downlink data from cloud services. Edge computing allows terminal devices to migrate storage and computing tasks to network edge nodes, which can not only meet the computing device expansion requirements of terminal devices, but also effectively save the transmission link resources of computing tasks between terminal devices and cloud servers. The direct transmission of local information solves the problem of low timeliness of information processing and improves processing efficiency. Because edge computing is closer to the data source, data can be obtained in the first time, and the data can be analyzed and intelligently processed in real time, which is more efficient and secure than pure cloud computing.

With the continuous advancement of IoT applications such as smart cities and intelligent transportation, and the rapid development of new service models such as spatial location services and mobile payment services, the number of IoT

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device connections and the data generated have shown a massive growth trend [1]. The traditional cloud computing model adopts a centralized processing method to transfer all data to the cloud computing center through the network. The powerful computing power of the cloud computing center is used to solve the computing and storage problems centrally. In the context of the Internet of Everything application, the limitations of cloud computing, such as the load of cloud computing centers, transmission bandwidth, and data security, have become increasingly prominent. The massive amounts of data generated by various access devices make the network bandwidth of cloud computing even more Limited, overwhelming the cloud, causing greater data bottlenecks. For example, cloud computing delay-sensitive business systems do not work well. These delay-sensitive services are often at the edge of the data center, and can use nearby computing equipment to complete calculations and reduce latency; for connected vehicles in high- real-time smart transportation, fire detection and fire protection systems, and highly distributed architectures online Cloud computing models focused on data centers, such as mobile video content delivery, have been unable to meet demand [2]–[4]. Therefore, the edge computing model has emerged at the historic moment, and has become a research hotspot in recent years, especially in the field of urban transportation.

Cloud computing plays a vital role in processing large amounts of data. But with the advent of the Internet of Things, huge amounts of data have been generated from these devices. Therefore, it is necessary to bring the characteristics of the cloud closer to the request generator so that the processing of these massive data occurs at a hop distance closer to the end user. This has led to the emergence of fog computing, which aims to provide storage and computing at the edge of the network to reduce network traffic and overcome many cloud computing deficiencies. Fog computing technology can help overcome the challenges of big data processing. Singh S and other scholars discussed the classification of fog computing, which is different from cloud computing and edge computing technologies. They believe that its application is the key to the application of emerging key technologies [5]. Scholars such as Wang K have moved some storage and computing functions to the edge of the network, and edge computing has great potential to solve mobile vehicle network challenges. However, effective use of heterogeneous edge computing architectures and deployment of large-scale IoV systems remains a challenge. Wang K, *et al.* Focused on the collaboration between different edge computing anchors and proposed a novel collaborative vehicle edge computing framework. Specifically, CVEC can support more scalable in-vehicle services and applications through horizontal and vertical collaboration. In addition, Wang K, and other scholars discussed the architecture, principle, mechanism, special circumstances and potential technical support of CVEC [2].

In recent years, the industry's investment and research interest in edge computing has grown dramatically. In edge computing, computing and storage nodes are placed on the edge of the Internet near mobile devices or sensors. This emerging technology is expected to provide highly responsive cloud services for mobile computing, the scalability of the IoT, and privacy policy enforcement, and to shield against temporary cloud disruptions. The purpose of this paper is to study the application of edge computing technology in the collaborative optimization of intelligent transportation systems based on information and physical fusion. The purpose of this paper is to study the application of edge computing technology in the collaborative optimization of intelligent transportation systems with information and physical fusion, and to explore the future development trends. This article collects the data of each traffic intersection by setting monitoring points at different traffic intersections. For some of the intersections, Cao Yong edge computer technology processes the information signals generated by the intersections. Some intersections use the traditional monitoring system plus the intelligent traffic coordination method. By comparing the work efficiency and utility under the two methods, fitting data is performed, and mathematical statistics and mathematical analysis methods are used to verify the fitted data. The experimental data show that the intelligent transportation system with the integration of edge computing technology in the information physics can help the processing of traffic conditions, and the overall work efficiency of each system has been greatly improved.

II. PROPOSED METHOD

A. INTELLIGENT TRANSPORTATION SYSTEM

The intelligent transportation system integrates communication, computer, electronics, sensors, automatic control and other technologies, organically combines vehicle, driver, road and other information, and constructs a large area, real-time and accurate traffic information management system. Its can improve urban traffic congestion, ensure travel safety, and effectively improve the traffic efficiency of vehicles. One of the core functions of its is to process real-time traffic information. How to collect, solve, analyze and reasonably use the complicated traffic information is the key research content of its service in the future. A modular intelligent transportation system, comprising an environmentally protected enclosure, a system communications bus, a processor module, communicating with said bus, having a image data input and an audio input, the processor module analyzing the image data and/or audio input for data patterns represented therein, having at least one available option slot, a power supply, and a communication link for external communications, in which at least one available option slot can be occupied by a wireless local area network access point, having a communications path between said communications link and said wireless access point, or other modular components. Emerging technologies toward a connected vehicle infrastructure pedestrian environment and big data have made it easier and cheaper to collect, store, analyze, use, and disseminate multi-source data [6]–[8]. The connected environment also introduces new approaches to flexible control and management of transportation systems in real time to improve overall system performance. Given the benefits of a connected environment, it is crucial that we understand how the current intelligent transportation system could be adapted to the connected environment.

1) COMPOSITION OF INTELLIGENT TRANSPORTATION SYSTEM

The intelligent transportation system consists of many subsystems, including not only traffic information service systems and traffic control systems, but also vehicle management systems, intelligent public transportation systems, electronic toll collection systems, and intelligent emergency rescue systems. The modern intelligent transportation system contains information, communication, and related technologies, which can provide people with road traffic conditions, public transportation information, subway or bus transfer times and methods, weather conditions, and a series of real-time information in a timely manner [9]. For motor vehicles with their own navigation systems, the existence of an intelligent transportation system helps car owners to choose convenient driving routes and adjust travel plans in a timely manner. The intelligent traffic management system is designed for traffic operations and managers. It uses real-time communication and technical monitoring to transmit traffic conditions and accidents under surveillance video to the traffic management center through network communication, which is convenient for collecting and organizing the traffic and road condition information of the day To achieve coordination and real-time update and control between systems. The research and development of intelligent public transportation system is aimed at improving the current "paralyzed state" of public transportation in China, increasing the efficiency of public transportation, and making road traffic, railway transportation and other operations to the best state with the dual assistance of intelligent systems and information networks Improve safety, improve road and railway information service levels and operational efficiency. The intelligent vehicle management system is inspired by the vehicle manufacturing industry and the mechanical design industry. It fully integrates sensors, computers and network communication tools, and uses automatic control technology to improve the existing highway facilities and vehicle conditions, make vehicle circulation safer, and control information more accurate. The intelligent electronic system uses advanced electronic information technology to make motor vehicles pass through high-speed toll stations and checkpoints faster and save time. At the same time, the system is linked to the network to quickly collect and integrate all the information of passing vehicles, such as owner information, vehicle age, usage, tax status, etc., stored in an electronic toll card in a timely manner, which is more simplified and more comprehensive than previous charging procedures, To ensure the safety of vehicle owners and high-speed traffic [10]–[12]. When an intelligent emergency rescue system has a traffic accident, the system can deal with it quickly and reasonably divert traffic. The system is divided into four aspects: vehicle breakdown, accident rescue, accident dispatch and rescue vehicle priority traffic, so that accidents can be resolved in the shortest time, and the degree of injury is reduced. The specific operation process is shown in Figure 1.

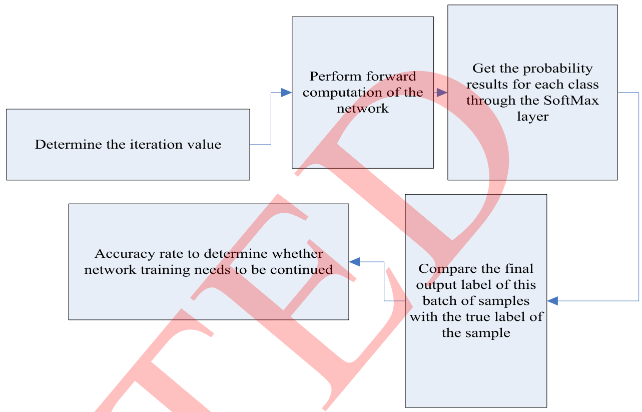

FIGURE 1. Structure of intelligent transportation system.

2) COMPOSITION OF INTELLIGENT TRANSPORTATION SYSTEM

Applications of intelligent transportation systems include universal cards, smart cars, real-time traffic information systems, automated highway systems, electronic toll systems, accident management systems, and video surveillance systems.

Wantong card looks like a debit card, and its role can refer to phone card and bus card. Its function is to calculate driver's parking fee, highway toll and other related fees. The innovation of the Metrohm card is that the card and the reader do not have to be in close contact, as long as they are within a certain distance, they can be sensed even if there is a gap [13]–[15]. Wantong card can be recharged, not a one-time card. This system provides users with great convenience, and also facilitates user management and system operation, which greatly reduces the use and maintenance costs.

The electronic toll collection system is generally a vehicle equipped with a signal receiver. Once it enters the toll area equipped with a signal detector, it obtains relevant data through signal interaction, and charges according to different standards through a Wantong card. Electronic toll systems are mostly found on highways or other areas, which can avoid tolls to a certain extent and alleviate traffic jams. The real-time traffic information system can provide users with a variety of available information, such as the general conditions of the road and the parking area. The vehicle-specific information receiver has multiple display modes such as voice control, text, and numbers, which facilitates centralized and integrated management and control in urban transportation, improves the efficiency of time and space utilization, and reduces traffic as much as possible at the same time. The frequency of accidents gives drivers more accurate driving guidance [16].

Smart cars combined with rich electronic control systems have greatly improved driving safety and driving efficiency. In the case of auto driving, the on-board computer uses radar, sensors, communication equipment and other tools to collect and organize various aspects of information to better guide and control the form of the car. If there are abnormal driving situations such as brake failure, speeding, and accidentally entering other dedicated lanes, the electronic control system of the car will automatically issue a signal warning and take measures to avoid risks, such as changing lanes. In the increasing number of modern urban traffic, The emergence of this kind of car is a boon for human beings, and its intelligent assistance system can give drivers and passengers the greatest safety factor. The automatic road system can open a dedicated lane on the existing road, drive the vehicle with a magnet specially set under the road, with the help of radar, determine the position of the vehicle and maintain the distance between the vehicle and the obstacle, and the vehicle will automatically drive between the roads Without any intervention, although this system has a good application prospect for expressways, it is not suitable for urban traffic, because the existing roads are not wide enough to meet the requirements for increasing the dedicated lanes. The system detects traffic accidents in time, evacuates the accident vehicles in time, reminds upstream vehicles to slow down, and prevents secondary accidents. Secondary accidents have become the main reason for the recent increase in the mortality rate of traffic accidents. Intersection traffic rules have been violated in the video display system. Video surveillance system can effectively reduce violations of automatic records and traffic rules, reduce driver violations and camouflage, and prevent traffic accidents at intersections [17]–[19].

B. INFORMATION PHYSICS FUSION SYSTEM

1) CHARACTERISTICS OF CYBER-PHYSICAL FUSION SYSTEM

At present, there is no authoritative definition of the concept of the cyber-physical fusion system. The existing definitions are mostly proposed based on the researchers' different concerns and description methods. Based on the comparison with embedded systems, industrial control systems, the Internet of Things and other related technologies, it is based on the essential characteristics of the information physical fusion system. The cyber-physical fusion system can be understood as a cash intelligence system that integrates technologies such as intelligent perception, deep computing, reliable communication, and precise control to connect the virtual digital world with the physical world, and firmly combines computing and physical resources. The deep integration of Internet of Things technology and control system has resulted in a cyber-physical fusion system. Intelligent perception is a unique gene of the Internet of Things, and precise control inherits the basic functions of the control system [20]–[22]. All in all, the information physics fusion system is a hybrid system formed by combining the discrete mode of the information space and the continuous dynamic mode of the physical world. The continuous variables representing the physical world and the discrete events reflecting the information space interact with each other to form an information. Drive dynamic systems that coexist with event-driven.

2) REAL-TIME NATURE OF THE SYSTEM

The cyber-physical fusion system has strict requirements on time. The sensing template should be aware of changes in the environment in a timely manner. The decision-making control template should be judged based on the timely data to control the physical process in a timely manner. Real-time performance is mainly reflected in two aspects: real-time network transmission and real-time task scheduling processing. At the same time, these two aspects are also the end points of the current research of cyber-physical fusion systems [23], [24].

In addition to the processing time extension, the most important thing is the introduction of two-way transmission delay, which is accompanied by delay jitter. As shown in formula (1):

$$\tau_i = RTT_{pcp}(i-1) + \hat{f}_{pe}(i) + \tilde{r}_{cp}(i) \tag{1}$$

$RTT_{pcp}(i-1)$ represents the guard transmission time of the i packet, $\hat{f}_{pe}(i)$ represents the change amount of the forward transmission delay from the sensor to the controller, and $\tilde{r}_{cp}(i)$ represents the estimation of the change of the reverse transmission delay from the controller to the sensor. Since the controller knows the value of $RTT_{pcp}(i-1)$ and $\hat{f}_{pc}(i)$ at the k_i time, and the value of $\tilde{r}_{cp}(i)$ can be inferred from the previous historical data, the delay of the i packet can be inferred, which is convenient for the controller to make decisions.

The real-time research of information physical fusion system also involves real-time operating system, real-time network transmission protocol, deterministic delay guarantee algorithm and real-time data collection mechanism. Generally speaking, the information physical fusion system is a very challenging research, involving a wide range and strict requirements. Information collection and control not only need to be correct, but also need to use expired information within a certain time limit, so as to avoid impact on the system.

3) THE CHALLENGE OF INFORMATION PHYSICAL FUSION SYSTEM

Real time of the system: the first task is to design a new model to meet the real-time requirements. Because there are a lot of sensors in these systems, actuators and computing devices need to exchange a lot of information. For example, due to the different location of sensor nodes, the topology of CPS network will change greatly, and a lot of information exchange is needed between systems to adapt to different applications.

Robustness and security: generally, the information interaction between systems will be affected by the uncertainty of the physical world. Different from the logic operation in computing system, CPS has high robustness and security.

Building dynamic system model: the biggest difference between physical system and information system is that physical system changes in real time with the change of process, while information system changes with the change of logic. CPS integrates the characteristics of the two to establish the corresponding dynamic model.

Feedback structure: dynamic changes will affect the performance of physical systems, especially the performance of wireless sensor networks. In order to solve this problem, many wireless network protocols must be designed to bridge the communication between physical layer and network layer. The feedback mechanism has a unified standard to restrict the information exchange between cross-layer and cross-border points, while meeting the traditional design and control scheme. Reflection structures provide specific reflection information, which is very important. They include perception data, performance parameters and data availability.

C. INTELLIGENT TRANSPORTATION CYBER-PHYSICAL CLOUD CONTROL SYSTEMS

1) EFFECTIVE BERTH PREDICTION MODEL OF DBN-SVR

Effective parking berth refers to the berths that can be used to park vehicles in the current parking lot. It has the characteristics of time fluctuation, space non-uniformity, and resource limitation. More rational use of resources. The earliest existing effective berth prediction mainly considered linear and non-linear prediction models based on time series. Construct an autoregressive moving average model to predict the demand for empty parking spaces in parking lots; construct a weighted first-order local prediction method for chaotic time series.

2) LONG AND SHORT-TERM MEMORY NETWORK CHARACTERISTICS

Long-term and short-term memory networks are a type of recurrent neural network and a type of deep neural network. They have a chain form of repetitive neural network modules and are suitable for processing and predicting important events with long intervals and delays in time series. Deep learning is a research hotspot in machine learning. It has been widely used in a variety of image processing and machine vision algorithms. This is still being developed and improved. Factor analysis is a model analysis method to find common factors. Based on the principal components, a clear common factor is established, and the observed variables are expressed using the common factor.

3) SHORT TERM TRAFFIC FLOW PREDICTION ALGORITHM

Since the traffic flow of each road section has temporal and spatial correlation, and the input data set of the prediction model is X_t, there are:

$$X_t = \{x_1, x_2, \ldots, \mathrm{x_p}\} \tag{2}$$

$$x_i = \{x_{i,t}, x_{i,t-\Delta t}, \ldots, x_{i,t-M\Delta t}\} \tag{3}$$

where: i = 1, 2,..., P, P represents the number of data columns, M represents the number of data acquisition intervals, $x_{i,t}$ represents the traffic flow of the ith road section at time t, and Δt represents the data time interval. The traffic flow of any road section at the next time is predicted by the traffic flow data of the current time and the previous M time of the adjacent road sections. Assuming that the output vector of the input data set after learning the characteristics of DBN model is H, there are:

$$H = \Phi(X_d) \tag{4}$$

$$x_{i,t}^d = x_{i,t} - x_{i,t-d} \tag{5}$$

where Φ represents the deep learning DBN network model, which is the traffic flow data set processed according to formula (5).

SVR is a nonlinear feedforward network with hidden elements, which can realize the prediction of time series:

$$f(x) = \sum_{i=1}^{l} \alpha_i^* y_i K(x_i, x) + b^* \tag{6}$$

$$K(x_i, x) = (\Phi(x_i), \Phi(x)) \tag{7}$$

where equation (7) is the core function, α_i^* is the positive component value, b^* is the threshold value and y_i is thetraining set output value.

From this, it can be concluded that the traffic flow prediction value of any section j at the time of t + △t is

$$y_d(j, t + \Delta t) = f(H) \tag{8}$$

where f is the prediction model of support vector machine (SVR), $y_d(j, t + \Delta t)$ is the traffic flow of the j section at the time of T + △T, j = 1, 2, . . . , P.

$$\hat{x}_{i,t+1} = \hat{x}_{i,t+1}^d + \hat{x}_{i,t-d+1} \tag{9}$$

The specific flow of the traffic flow prediction algorithm can be calculated from equation (9) to restore the original traffic flow data and get the actual traffic flow prediction value.

(2) Scheduling of edge computing technology under the coordinated optimization of intelligent transportation system with information and physical fusion.

Based on the predictive control idea in the cloud control system theory, according to the traffic road network weight matrix, according to the cloud artificial intelligence short-term prediction data proposed above, the user's travel route is induced by the shortest path obtained by the solution, combined with the traffic flow allocation method The intelligent transportation cloud control system prediction and scheduling scheme is designed, which can realize the real-time control of cloud rolling prediction of traffic flow.

Due to the time-varying nature of road traffic, the traffic flow allocation control program performs a cyclic update operation in the cloud at intervals of 5 minutes to ensure the real-time nature of the shortest path and traffic flow allocation. As an important index in traffic flow distribution, traffic impedance directly affects the choice of road traveler paths and the distribution of traffic in the road network. The road segment impedance function can accurately describe the traffic impedance, which is the relationship between the road segment travel time and the road segment flow, the intersection delay and the intersection flow. In the specific flow distribution process, the traffic impedance is composed of the travel time of the road section and the delay of the intersection. Assuming that a vehicle passes through a road section, the travel time required, that is, the road section impedance is t, then the road section impedance function is:

$$Z_a \leq C \quad t_a = 2t_0(1 + \sqrt{1 - \frac{Z_a}{C_a}})^{-1} + T_a, \tag{10}$$

$$Z_a > C_a \quad t_a = 2t_0(1 - \sqrt{1 - \frac{Z_a}{C_a}})^{-1} + T_a. \tag{11}$$

When the road is congested, the intelligent traffic cloud control system optimizes the shortest path in real time, and induces the user to walk according to the shortest path. Here, it is assumed that the driver chooses the path with the least traffic impedance according to the allocated traffic volume of the road network. The OD traffic volume of a specific congested road section is reasonably allocated to the shortest path connecting the OD point pair, and each road section gets the traffic flow distribution value x_a.

III. EXPERIMENTS

A. EXPERIMENTAL BACKGROUND AND SETTINGS

In the simulation experiment of intelligent traffic information physical fusion edge computing technology, the local computer selected a computer with a 4-core CPU, a maximum frequency of 2.9GHz, and a memory of 8 GB. The cloud server chooses to rent a mature commercial cloud server: Beijing's three districts, computing C2, 4-core CPU, 8GB memory server. The configuration of this cloud server is consistent with the local simulation experiment computer configuration, the maximum bandwidth is 100Mpbs, and the system uses Windows server 2012 R2 standard version. 64-bit Chinese version. At the same time, multiple servers can be selected to provide multiple tasks and multiple types of operation. The more cloud servers you choose, the higher the cost. The maximum configuration of the operator server computer purchased can be a computing server with a computing C2, 32-core CPU, and 120 GB of memory. Computational C2 is the best choice for high computing performance and high concurrent read and write applications. When the information transmission requires low delay and high transmission volume, a high I / O type I2 server can be selected. This server is the best choice for high disk I / O. It provides tens of thousands of low-latency random I / O operations (IOPS) per second with a packet forwarding capacity of up to 300,000 pps. Type application.

In the short-term traffic flow prediction simulation experiment, we used data from the California Department of Transportation's Performance Test System (ie, the Caltrans PeMS database) for experimental verification. Due to the strong time-related regularity of traffic flow data and the great difference between non-weekend and weekend data, in order to fully and effectively verify the method proposed in this paper, we choose ten different road traffic flow detection points, Buena, Burbank, Commerce, Downey Glendale, La Mirada, Los Angeles, Norwalk, Santa Clarita and Santa Fe Springs.

B. SPECIFIC STEPS OF THE EXPERIMENT

The experiment randomly selected the traffic volume within a certain period of time, using data from every Wednesday, and collected 4 sets of traffic flow data at each detection point. The number of data samples per test point per day is 351, the total data of each test point is 1372, and the total data set sample size is 14,382. The minimum sampling time interval of the traffic flow data we can get from the Caltrans PeMS database is 5min. In this paper, the original traffic flow data collected on a specific date is processed to form a data set with a sampling interval of 5min as the input and output of the intelligent prediction model Data set to verify the effectiveness of the prediction algorithm. The first three sets of 8,649 traffic data from June 21, June 28, and July 5 were used to train the intelligent learning model, and finally the trained intelligent learning model was used to Four sets of 3148 data were used for prediction verification.

TABLE 1. Test results of several algorithms on UCF-101 library.

Algorithm	Accuracy
C3D	82.3%
Next-Flow	72.2%
Flow Net Baseline	62.0%
Ours	71.9%
Number	10

IV. DISCUSSION

A. SHORT-TERM TRAFFIC FLOW PREDICTION SIMULATION BASED ON DBN-SVR

As shown in Table 1 and Figure 2, under different circumstances, the situation changes differently, the percentage of major events is basically the same, indicating that the impact factors of each condition are the same. It can be seen from the figure that the types and percentages are not only the same And the percentages are basically the same. In the cloud server and local computer Matlab 2014a environment, the parameters of the DBN-SVR network model are set as follows: The number of RBM network layers in the DBN model is 3, and the number of nodes in each layer is 4, 4, and 2, respectively. The number of training iterations for the corresponding weights is taken 10 times. The kernel function of the top-level prediction model SVR is the RBF radial basis function, the kernel function parameter g is 16,

TABLE 2. Test results on self-built behavior library.

Type of conduct	Rate of missing report	False alarm rate
Come to blows	9.5%	5%
Run	8.6%	4.3%
Boom	11.7%	9.7%

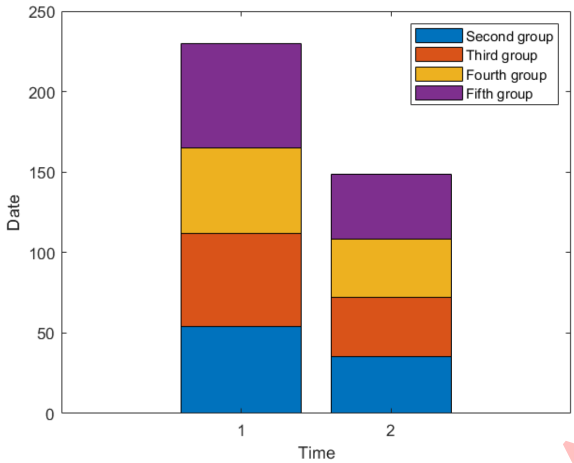

FIGURE 2. Preventive effect index of experimental group.

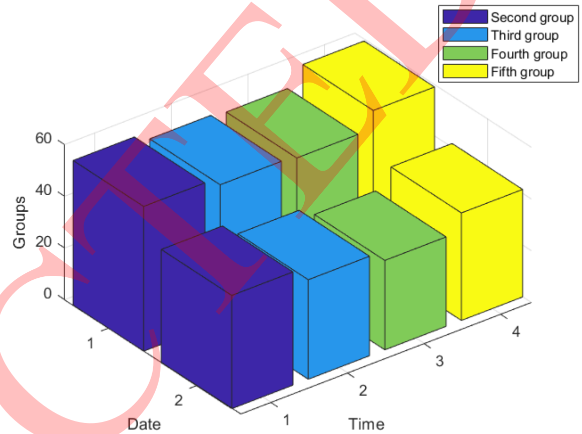

FIGURE 3. Application of intelligent transportation system.

and the penalty factor c is 11.3137. Then compare and analyze the results of the traffic flow test data set. The average local running time is 8.5262s, and the running time in the cloud server is 5.2758s. The specific data is shown in Table 1 and Figure 2.

(2)In order to test the performance of algorithm, this section trains and predicts the traffic dataset. It can be seen from the obtained data stream that the processes are not nearly the same, and the percentages are basically close. This may be related to the scheme. All test results use the sigmoid function to perform input and output data on the traffic flow limit learning training data set [0, 1] Normalized processing. Traffic flow prediction simulation experiment runs at an average time of 0.6268s in the local area and 0.3467s in the cloud server. The running time of the cloud server simulation experiment is significantly reduced, and the data calculation capacity is significantly stronger than the local giant day data, as shown in Table 2 and Figure 3.

B. SPECIFIC ANALYSIS OF EXPERIMENTAL ERROR

(1) From the upward trend in Figure 3, and the area occupied is different, combined with the STM prediction method used in this paper, the results of the experiment are not as good as expected, and there is a certain gap between the expected average percentage variance. And because of the high frequency of short-term data acquisition, the number is not small. The number of input nodes of the LSTM algorithm is 758, and the number of output nodes is 261. It is difficult to adjust the parameters, and the calculation time of the calculation side is 567.2365s. At the same time, after research, in the process of rigorous speculation on a small sample of traffic data for a single test, we can draw relevant conclusions: In order to control prediction errors and ensure good results, the DBN-SVR model should not be used to predict small samples of a single node Instead, the data of a small sample of a single node. The specific data is shown in Figure 3.

(2)It can be clearly seen from the zigzag pattern of Figure 4 that the edge computer can only work well after debugging and adaptation. At the initial stage of installation, due to the lack of understanding of the performance of the system name, the operation of workers is limited by the knowledge they have. After subsequent training, the use of edge computers and the coordination role in the transportation system have improved qualitatively. Therefore, from the data in the figure, using edge computing technology to predict traffic flow in intelligent transportation systems, you can use the DBN-SVR model to accurately infer large sample data with several detection nodes model to accurately The small sample data of a single detection node is inferred. The two algorithms are used alternately and work closely together to ensure the good operation of the intelligent transportation edge computing technology system. The specific data is shown in Figure 4.

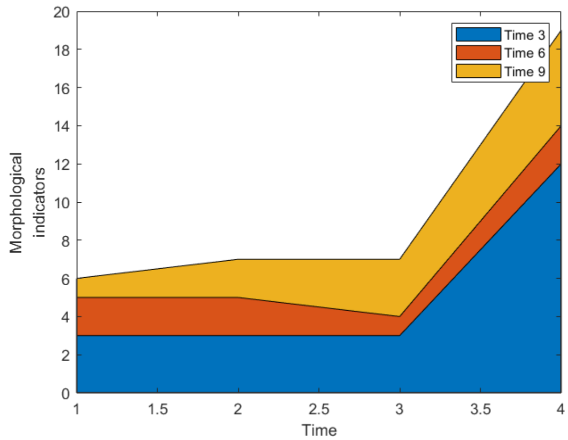

FIGURE 4. Combination of gene and protein.

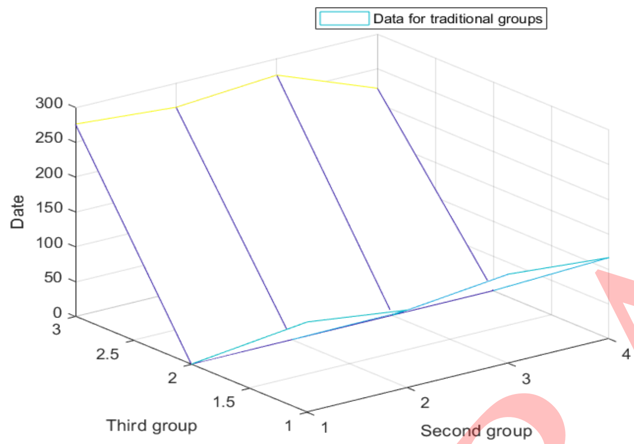

FIGURE 5. Combination of gene and protein.

V. CONCLUSION

This paper designs and analyzes the application of edge computing technology in the coordinated development of intelligent transportation systems with information and physical fusion, and discusses the application model of edge computing technology in the collaborative optimization of intelligent transportation systems with information and physical integration. The application in the transportation field was demonstrated. This paper uses deep learning methods and the use of over-limit learning prediction algorithms to accurately predict the overall road network traffic flow and predict traffic conditions. Use the traffic flow distribution algorithm to intelligently adjust the diverted traffic flow to reduce traffic congestion.

In addition, in the intelligent transportation system that is collaboratively optimized under the integration of information physics, learning algorithms and traffic flow shunting methods are used to reduce the problem of limited computing space faced by traditional intelligent transportation equipment, effectively guarantee the normal use of equipment, and reduce the construction of intelligent transportation systems. And maintenance costs. At present, edge computing technology is still in the development stage. The application of intelligent transportation system collaborative optimization of information and physical fusion is the initial application of edge computing technology. How to efficiently classify and process complex traffic data on the edge computing end, adopt the most efficient The real-time edge computing control scheme for intelligent transportation is still a practical problem that needs to be solved in the application research of intelligent transportation system coordination and optimization using edge computing technology.

In summary, the intelligent transportation system can provide intelligent services for transportation participants. Through the traffic information collection platform, the intelligent transportation system collects traffic information extensively, effectively collects and processes the traffic information of the subsystems, and effectively controls the traffic. Abstract: Edge computing technology is an important computer operating system in China. It plays a key role in multi-system fusion and intelligent manufacturing, and can play a key role in training and testing of deep neural networks. The purpose of this paper is to study the application of edge computing technology in the collaborative optimization of intelligent transportation systems based on information and physical fusion. This article sets up monitoring points at different traffic intersections, and applies long-term and short-term memory networks to collect data at each traffic intersection. The DBN-SVR method model was used to detect the traffic flow of some intersections, and the edge computer technology was used to process the information signals generated by the intersections. The other portions of the intersections used traditional monitoring systems. By comparing the work efficiency and utility under the two methods, fitting data is performed, and mathematical statistics and mathematical analysis methods are used to verify the fitted data. The experimental data show that the edge computing technology can help the processing of traffic conditions in the intelligent transportation system integrated with information and physics, which has greatly improved the overall work efficiency of each system. Experimental data shows that intelligent transportation systems that integrate edge computing technology with information physics have improved transportation efficiency by about 20% and urban security by about 35%, which has a great effect on building smart cities and safe cities.

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