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Research Article

Mobile Geographic Information Service for 4G Terminal

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The mobile geographic information service (GIS) is the key technology to realize mobile navigation. In this study, a transmission method of mobile geographic information services under the 4G terminal grounded on the channel Porter interval equalization algorithm is proposed. The multisensor information collection method of vehicle networking is adopted to realize data collection and data structure characteristics analysis of mobile GIS under the 4G terminal. Subsequently, the transmission channel model of mobile GIS under the 4G terminal is constructed. Furthermore, the interference suppression in the transmission process of mobile GIS under 4G terminals is realized by using an autocorrelation matching filter and an adaptive association rule mining algorithm. According to the symbol feature distribution of the mobile GIS channel under the 4G terminal, the Porter interval equalization approach is implemented to realize the segmented equalization adjustment of mobile GIS. The K-means clustering procedure is also implemented to coordinate the data packet adjustment in the process of mobile geographic information service transmission within the background of a 4G terminal. According to the dynamic distribution characteristics of the clustering center, the mobile geographic information service transmission under the 4G terminal is adaptively controlled to reduce the influence of channel fading and intersymbol interference caused by channel spreading. The simulation outcomes express that the suggested technique has strong anti-jamming ability, reduces the communication error rate, significantly diminishes the end-to-end delay performance, and improves the stability and accuracy of the mobile geographic information service transmission under the 4G terminal.

1. Introduction

Since its birth, geographic information system (GIS), following the pace of the development of the times, has integrated many disciplines and related technologies, combined with traditional science and modern technology. It has been widely used in geographic mapping, environmental assessment, urban planning, regional sustainable development, military applications, government office management and decision-making, and plays a progressively imperative character in the national defense construction and national economy. The 21st century is a new century with high development of informatization, networking, digitalization and intelligence. The places where people use the Internet gradually shift from indoors and offices to outdoors, and from fixed time to anytime and anywhere, which greatly promotes the birth of mobile GIS. The breakthrough of computer and information technology makes all kinds of embedded devices not only cheaper than large electronic devices such as computers, but also occupy a huge advantage in volume and weight, so that users can carry them with them, and their ability to process data is faster and faster, which is just mobile. The emergence and development of embedded intelligent mobile terminals, such as PDA, smart phones, etc., has just become the best choice for mobile GIS. Since its birth, geographic information system (GIS), following the pace of the development of the times, has integrated many disciplines and related technologies, combined with traditional science and modern technology. It has been widely used in geographic mapping, environmental assessment, urban planning, regional sustainable development, military applications, government office management and decision-making, and plays a progressively imperative character in the national defense construction and national economy [1].

The interference suppression and filtering analysis in the transmission process of mobile geographic information service under 4G terminal are carried out by autocorrelation matching filter and adaptive association rule mining device.

Combined with error compensation, the stability and real-time performance of mobile geographic information service transmission under 4G terminal are improved, but the packet reception performance of this method is poor in the strong interference background [2]. The authors in [3] have put forward the control method of mobile geographic information service under 4G terminal with direct sequence spread spectrum. It uses direct sequence spread spectrum transmission method to transmit mobile geographic information service under 4G terminal with spatial multipath channel, which reduces the output bit error rate, but the computational load is high. A control method of mobile geographic information service under 4G terminal is proposed which is based on the autocorrelation matching filter and adaptive association rule mining in [4].

To resolve the aforementioned issues, in this paper we put forward and suggest a transmission approach for mobile geographic information service under the 4G terminal which is grounded on the channel Porter interval equalization algorithm. Firstly, the multi-sensor information collection method of car networking is adopted to realize the data collection and data structure feature analysis of mobile geographic information service under the background of 4G terminal. In the next stage, according to the symbol feature distribution of the mobile geographic information service channel within the background of 4G terminal, the Porter interval equalization method is adopted to realize the segmented equalization adjustment of the mobile geographic information service transmission under the 4G terminal, and adaptive error compensation and channel fading suppression are adopted. Finally, the K-means clustering procedure is implemented to coordinate the data packet adjustment in the process of mobile geographic information service transmission under the 4G terminal. To assess the results, the Matlab simulation investigation approach is implemented to understand the transmission quality of the mobile geographic information service under the 4G terminal, which displays the greater performance of the suggested approach in enhancing the control aptitude of the mobile geographic information service under 4G terminal. The major contributions of our research are as follows:

(i) A transmission method of mobile geographic information service under the 4G terminal which is grounded on the channel Porter interval equalization algorithm is proposed.

(ii) The multi-sensor information collection method of vehicle networking is adopted to realize data collection and data structure characteristics analysis of mobile GIS under the background of4G terminal, and the transmission channel model of mobile GIS under the 4G terminal is constructed.

(iii) The interference suppression in the transmission process of the mobile GIS under the 4G terminal is realized by using the autocorrelation matching filter and the adaptive association rule mining algorithm.

(iv) The K-means clustering procedure is finally implemented to coordinate the data packet adjustment in the process of mobile geographic information service transmission under the 4G terminal.

The rest of the paper is summarized as follows. Channel model and signal analysis of mobile geographic information service under 4G terminal are deliberated in section 2. transmission optimization of mobile geographic information service under 4G terminal is presented in Section 3. The proposed model is also discussed in this section. Experimental results and evaluation of the model is sketched in section 4. summary of the related work is given in section 5. lastly, section 6 summarizes the major outcomes of this study and discuses some future work.

2. Channel Model and Signal Analysis of Mobile Geographic Information Service under 4G Terminal

2.1. The Channel Model. In order to understand the transmission and optimization control of mobile geographic information services under 4G terminal based on channel Porter interval equalization algorithm, the mobile geographic information service channel model under the 4G terminal is constructed by combining the routing protocol control and channel model equalization design of the 4G terminal, and the transmission channel model of the mobile geographic information service under 4G terminal is reorganized by single copy routing algorithm SimBet [5]. Combining the passive time reversal mirror (PTRM) and the BPSK modulation technology, the mobile geographic information service channel model under the 4G terminal is established. According to the attenuation of the transmission bandwidth of mobile geographic information service under the background of 4G terminal in communication network, the weighted vector of the channel and the frequency component of the output signal are obtained. Combined with the convolution operation, the transmission and equalization design of mobile geographic information service under the 4G terminal is realized. The structure model of the data input and output is shown in Figure 1.

According to the structural model of data input and output of mobile geographic information service under 4G terminal shown in Figure 1, the optimal distribution control of time series of mobile geographic information service data under 4G terminal is carried out according to the attenuation of transmission bandwidth of mobile geographic information service under 4G terminal of communication network, and the multi-sensor information collection method of vehicle networking is adopted to realize data collection and data structure characteristic analysis of 4G terminal [6]. Assuming that the mobile geographic information service data signal $p(t)$ under the 4G terminal, the coordinated communication data sequence transmitted by PS after waiting for a period of time is $S(t)$, combined with Wigner-Ville distribution detection, through time reversal, the output processed by the reverse mirror is as follows in (1):

$$p_{ri}(t) = p(t) * h_i(t) + n_{pi}(t). \tag{1}$$

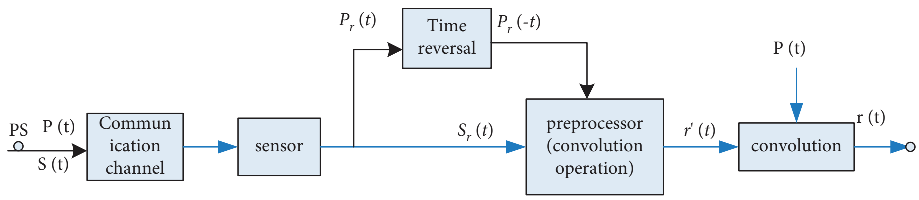

FIGURE 1: Structure model of data input and output of mobile geographic information service under 4G terminal.

In the above formula, $h_i(t)$ characterizes the attenuation coefficient of response of the impulse characteristic quantity for the mobile geographic information service data under the 4G terminal in the multipath channel. Moreover, the mobile geographic information service transmission channel equalization control under the 4G terminal is carried out on the continuous sliding window to obtain the symbol sequence after the matched filtering processing of the mobile geographic information service data under the 4G terminal. The formula is illustrated in the following (2):

$$S_r(t) = S(t) * h(t) + n_s(t), \tag{2}$$

wherein, $n_s(t)$ is the interference noise on the data collection bandwidth of mobile geographic information service under 4G terminal. After it is processed by pre-processor $P_r(-t)$, the relevant autocorrelation matching filter and adaptive association rule mining output are as follows in (3):

$$S_{ri}(t) = S(t) * h_i'(t) + n_{si}(t), \tag{3}$$

wherein, $h_i'(t)$ is the response function after filtering on $S(t)$, and the bandwidth of mobile geographic information service transmission array element sequence under 4G terminal is estimated using (4):

$$r_i'(t) = S_{ri}(t) * p_{ri}(-t) = S(t) * p(-t) * h_i'(t) * h_i(-t) + n_{1i}(t), \tag{4}$$

wherein, $S(t)$ is the local signal, $S_{ri}(t)$ is the multipath signal, $p_{ri}(-t)$ is the power spectral density, and $r(t)$ is used to characterize the noise component. The signal component in the extended signal of mobile geographic information service under the 4G terminal of spatial multipath channel is approximately the information signal waveform, and the output interference suppression component is given in (5):

$$\begin{aligned} n_{1i}(t) = {} & S(t) * h_i'(t) * n_{pi}(-t) + n_{si}(t) * p(-t) * h_i(-t) \\ & + n_{si}(t) * n_{pi}(-t), \end{aligned} \tag{5}$$

wherein, the variable $n_{pi}(-t)$ characterizes the noise element of the p symbol sequence, and the variable $n_{si}(t)$ exemplifies the noise element of the s symbol sequences. According to the above processing, a transmission channel model for the mobile GIS under the background of 4G terminal is constructed, and the anti-interference design of signal transmission is realized by using the autocorrelation matching filter and the adaptive association rule mining algorithm [7].

2.2. Transmission Signal Analysis. Assuming that the mobile geographic information service under the 4G terminal transmits each node b_i, and the number of pulse frames of the channel impulse response is N_f frames. Furthermore, the time required for the diffusion stage is obtained as $T_{\text{spray}} = \max(t_i)$by using the autocorrelation matching filtering and the adaptive association rule mining. In this way, the extended signal output by the mobile geographic information service data under the 4G terminal is as follows in (6):

$$\begin{aligned} r(t) &= \sum_{i=1}^{M} r_i'(t) * p(t) \\ &= S(t) * p(t) * p(-t) \\ &\quad * \sum_{i=1}^{M} h_i'(t) * h_i(-t) + \sum_{i=1}^{M} n_i(t). \end{aligned} \tag{6}$$

In the above formula, $n_i(t)$ is also the noise interference term of the flower girl in the transmission channel of the mobile geographic information service under the background of 4G terminal: $n_i(t) = n_{1i}(t) * p(t)$, and the forwarding delay depends on the diffusion delay. Therefore, in the transmission process of the mobile geographic information service under the 4G terminal, the fuzzy matching degree function of mobile geographic information service transmission under the 4G terminal is obtained by introducing the fuzzy degree function and adopting the feature clustering algorithm which is given as illustrated in (7):

$$\begin{aligned} H(t) &= \hat{h}(t) * p(t) * p(-t) \\ &= \left(\sum_{i=1}^{M} h_i'(t) * h_i(-t) \right) * p(t) * p(-t), \end{aligned} \tag{7}$$

wherein, $\hat{h}(t)$ and $p(t) * p(-t)$ are similar to the impulse response function, $p(t)$ and $p(-t)$ represents the spectrum components of the impulse response signal in the forward and negative sequences respectively, and $*$ is convolution operation. By using the time-frequency analysis method, the signal components of the mobile geographic information service channel under the background of 4G terminal are processed by feature focusing through calculation, and the following results are obtained using (8):

$$|s(f)| = A\sqrt{\frac{1}{2k}\left\{[c(v_1) + c(v_2)]^2 + [s(v_1) + s(v_2)]^2\right\}}, \tag{8}$$

wherein, $A(t)$ is the amplitude of mobile geographic information service signal under the 4G terminal, and f_0 is the initial transmission frequency of mobile geographic information service channel under the 4G terminal. Similarly, $k = B/T$ is the BPSK modulation component of mobile geographic information service under the background of 4G terminal, and B is the frequency modulation signal bandwidth [8]. This should be noted that the spread spectrum algorithm is adopted to acquire the statistics and other information flow of the output signal in the delay time interval, therefore, subsequently the data clustering algorithm is adopted and implemented in order to obtain the transmission gain of the mobile geographic information service under the 4G terminal as follows in (9):

$$E = \|x(t)\|^2 = \sum_j \sum_k \left|C_j(k)\right|^2 = \sum_j E_j, \tag{9}$$

wherein, $x(t)$ is the time series of mobile geographic information service transmission signal under the background of 4G terminal, $C_j(k)$ is the data delivery delay, and the variable E_j is the amplitude modulation parameter. According to the above channel and signal analysis statistics, conferring to the symbol feature distribution of the mobile geographic information service (GIS) channel under the background of 4G terminal, the Porter interval equalization method is adopted to realize the segmented equalization adjustment of the mobile geographic information service transmission under the 4G terminal.

3. Transmission Optimization of Mobile Geographic Information Service under 4G Terminal

3.1. Mobile Geographic Information Service Transmission Channel Equalization under 4G Terminal. The channel equalization model of mobile geographic information service under 4G terminal is established by adopting adaptive control of link forwarding protocol and Porter interval equalization control [9]. In the process of forward transmission and reverse transmission [10], the time-frequency characteristic components of mobile geographic information service signal received by the receiver under 4G terminal are as follows in (10):

$$s(t) = \cos\left[2\pi f_0 t + \pi\beta t^2 + \psi_0\right], \tag{10}$$

wherein, f_0 and $\psi_0$are the initial frequency and initial phase of the multipath channel of the mobile geographic information service under the 4G terminal, respectively. In the next stage, we estimate the statistical characteristics of the unit to be detected, and construct the spread spectrum distribution model of the mobile geographic information service channel under the 4G terminal. In fact, we obtain the extended bandwidth loss as follows in (11):

$$X' = \sum_{v=1}^{V} b_v X_v, \tag{11}$$

wherein, $\{b_v, v = 1, 2, \ldots, V\}$ is the impulse weighting coefficient of the mobile geographic information service transmission channel under the background of 4G terminal, and $X_v$represents the distance ambiguity parameter. As the propagation attenuation coefficient, the multipath spectrum bandwidth of mobile geographic information service under the 4G terminals is $p(t)$, and the channel equalization control model of mobile geographic information service under multiple 4G terminals in multidimensional road network space is constructed by adopting iterative learning and adaptive control methods [11]. Moreover, the channel equalization adjustment output is as follows in (12):

$$H(z) = Am \cdot \frac{1 + 2z^{-1} + z^{-2}}{\left(1 - \rho e^{j\phi} z^{-1}\right)\left(1 - \rho e^{-j\phi} z^{-1}\right)}, \tag{12}$$

wherein, z is the transfer function of mobile geographic information service under the 4G terminal, A is the amplitude of path loss, and m is intersymbol interference. Using the pole estimation, the mobile geographic information service signal output under the background of 4G terminal located in road network is as follows in (13):

$$x(n) = A\cos(0.3\pi n + \varphi) + v(n), \tag{13}$$

wherein, φ is the output extension phase of the mobile geographic information service under the 4G terminal, and $v(n)$ is the intersymbol interference caused by path extension. By introducing the multi-scale characteristics of channel transmission, combined with man-machine interaction control, the transmission control and adaptive adjustment of mobile geographic information service under the background of 4G terminal are carried out.

3.2. Data Clustering and Transmission Optimization of Mobile Geographic Information Service under 4G Terminal. Adaptive error compensation and channel fading suppression are adopted, and the data packet coordination adjustment in the transmission process of mobile geographic information service under the 4G terminal is carried out through K-means clustering algorithm. According to the attenuation of the transmission bandwidth of mobile geographic information service under the 4G terminal of communication network, the optimal distribution interval sampling of data time series of mobile geographic information service under 4G terminal is carried out [2], and the clustering function is as given in (14):

$$s(t) = \sum_i b_j \sum_{j=0}^{N_f - 1} p\left(t - iT_s - jT_f - c_j T_c\right), \tag{14}$$

wherein, b_j is the interference item of mobile geographic information service data under 4G terminal, T_s is the time sampling interval, and c_j is the transmission bandwidth of mobile geographic information service under 4G terminal. Moreover, it is assumed that the similarity of mobile geographic information service data under the 4G terminal is $h(n)$, the nonlinear equilibrium parameter of mobile geographic information service under terminal is $n(n)$, the time domain loss is $\tilde{x}(n)$, and the intersymbol interference is $y(n)$. Under the limited symbol rate, the channel is overlapped by convolution, and the K-means clustering of mobile geographic information service data under terminal, as shown in Figure 2, is adopted [12].

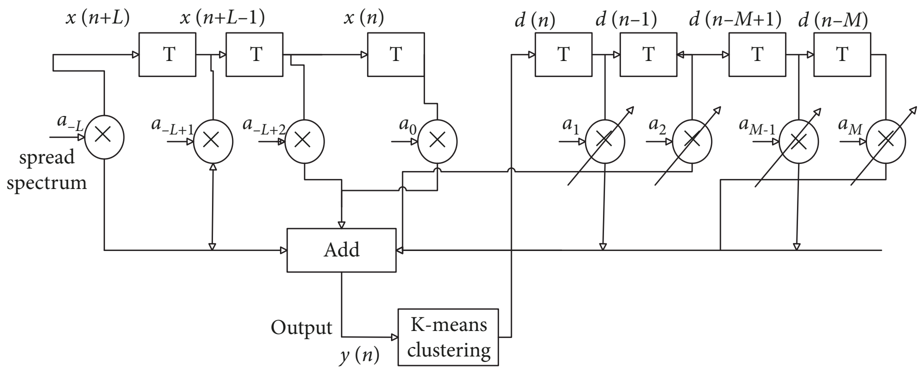

Figure 2: The *K*-means clustering of data.

According to the clustering result of mobile geographic information service data under the 4G terminal in Figure 2 as the output, the spectral components of communication data output are as follows in (15):

$$S\left(n_j\right) = \left(E_{elec} + E_{DF}\right)l\delta + E_{Tx\left(l,d_j\right)} = l\delta + lE_{elec} + l\varepsilon_{fs}d_j^2 = \left[\left(E_{elec} + E_{DF}\right)\delta + E_{elec} + \varepsilon_{fs}d_j^2\right]l, \quad (15)$$

wherein, E_{elec} is that superposition component of mobile geographic information service in 4G terminal at the identical period and in the matching phase. Furthermore, E_{DF} is the attenuation loss of multipath extension of mobile geographic information service in 4G terminal. Note that the variable $E_{Tx(l,d_j)}$ is the channel impulse characteristic quantity of mobile geographic information service transmission in the 4G terminal, ε_{fs}s the frequency spectrum parameter, l is the fuzzy information sequence, and d_j is the multipath component of probe signal. In the subsequent phases, we adjust the tap coefficient of mobile geographic information service transmission system in the 4G terminal, and the blind equalization method is adopted to suppress interference. Similarly, the adaptive control of mobile geographic information service transmission under the background of 4G terminal is carried out according to the dynamic distribution characteristics of the cluster centers, so as to reduce the channel fading and intersymbol interference which is potentially caused by the channel spread spectrum.

4. Simulation Experiment

In the experiment, the mobile geographic information output platform is built on the vehicle networking platform, and the moving vehicle navigation is used as the mobile geographic information service object. The vehicle driving cluster is kept at 24~100 m, and the speed on the line is 120 km/h. The RFID technology is used as the sensor in the motorcade, and 100 receiving array elements are set to form the array transmission array of mobile geographic information service under 4G terminal. The independent variable of mobile geographic information service transmission under 4G terminal indicates the distance between two nodes in the link establishment time, and the vehicle transmission is divided into The symbol transmission rate of mobile geographic information service under 4G terminal is set to 1 kBaud, the maximum delay of mobile geographic information service transmission under 4G terminal is set to 25 ms, the symbol distance is 100 m, the waiting time of mobile geographic information service data under 4G terminal is fixed at 10 dB, and the number of snapshots is changed from 200 to 2000. Rendering to the aforementioned simulation setting and parameter sceneries, the optimization simulation analysis of mobile geographic information service transmission under 4G terminal is carried out, and the results are as follows.

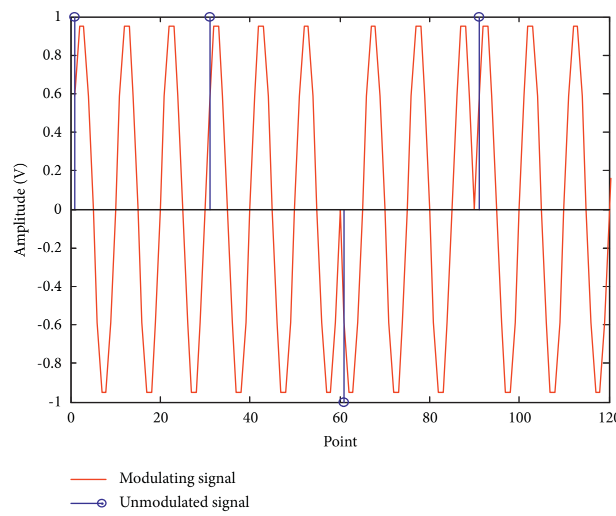

Figure 3: Distribution of transmission elements of mobile geographic information service under 4G terminal.

According to the array element distribution, as given away in Figure 3, the transmission model of the mobile geographic information service signal under the background of 4G terminal is constructed, and the output time series of mobile geographic information service data under the 4G terminal is obtained by taking the input signal-to-noise ratio of −10 dB, −5 dB and 0 dB, respectively, as exposed in Figure 4.

This should be noted that taking the output time series of the mobile geographic information service data under the background of 4G terminal shown in Figure 4 as a sample, cluster the mobile geographic information service data under 4G terminal, and get the clustering results as shown in Figure 5.

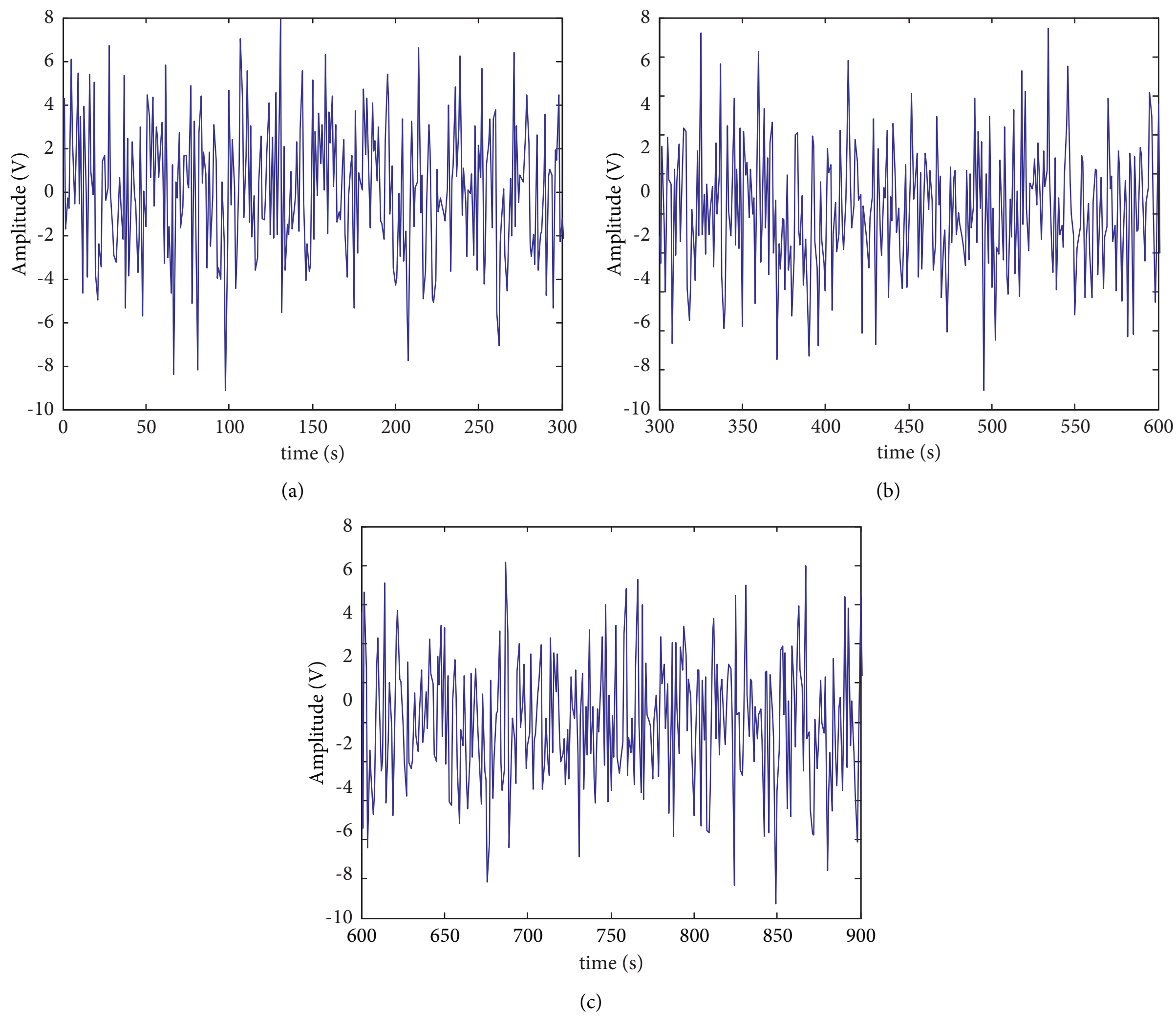

Figure 4: Output time series of the mobile geographic information service (GIS) data under the background of 4G terminal. (a) Transmission data sample 1 (SNR = 0 dB), (b) Transmission data sample 2 (SNR = −5 dB), (c) Transmission data sample 3 (SNR = −10 dB).

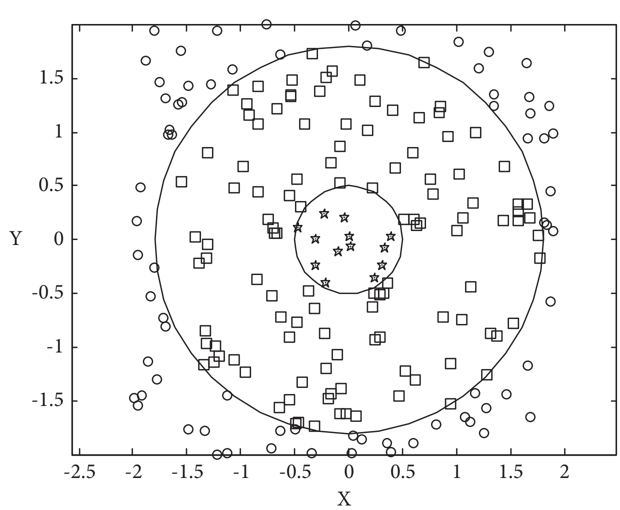

Figure 5: The 4G data clustering technique and attained results.

According to the analysis of outcomes given in Figure 5, the clustering of mobile geographic information service transmission under the 4G terminal is good, and the segmentation detection ability is enough strong. On this basis, the mobile geographic information service transmission under the 4G terminal is realized, and the speed and bit error rate of mobile geographic information service transmission under the 4G terminal are tested, and the comparison outcomes are given away in Figures 6 and 7, respectively. Through investigating the outcomes of Figures 6 and 7, it is found and easily comprehended that the anti-jamming ability of mobile geographic information service transmission under the 4G terminal is enough strong. The communication error rate is reduced, the end-to-end delay performance is reduced, the rate is high, and the stability and accuracy of mobile geographic information service transmission under 4G terminal are improved.

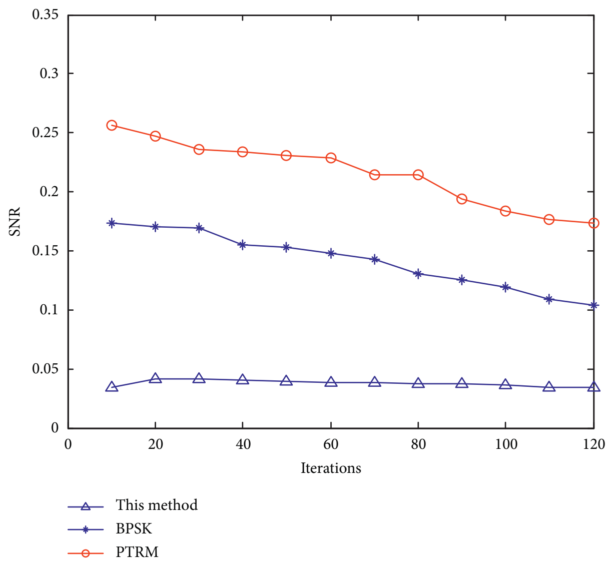

FIGURE 6: The error rate comparison of various approaches.

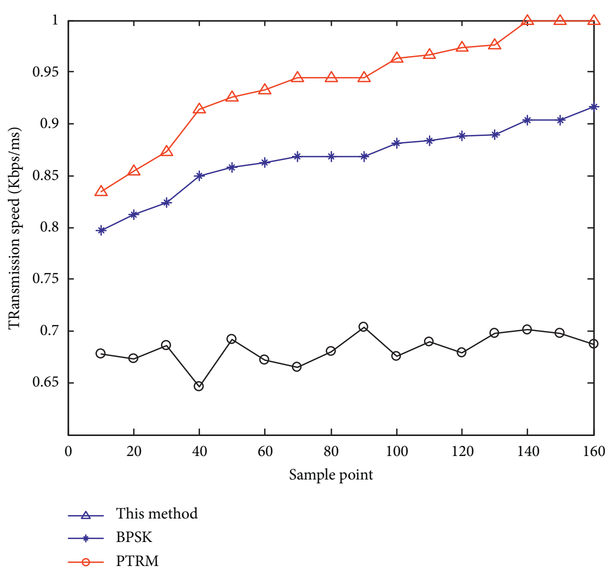

FIGURE 7: Comparison of the transmission rates of mobile geographic information service (GIS) under the background of 4G terminal.

5. Related Work

The 21st century is a new century with high development of informatization, networking, digitalization and intelligence. The places where people use the Internet gradually shift from indoors and offices to outdoors, and from fixed time to anytime and anywhere, which greatly promotes the birth of mobile GIS [13]. The breakthrough of computer and information technology makes all kinds of embedded devices cheaper than large electronic devices such as computers, and they have a huge advantage in volume and weight, so that users can carry them with them, and their ability to process data is faster and faster. The emergence and development of embedded intelligent mobile terminals, such as PDA, smart phones, etc., has just become the best choice for mobile GIS [14–16].

People attach great importance to the research on the security and stability of mobile geographic information service transmission under 4G terminal. Combining with the channel balance control of mobile GIS within the background of 4G terminal, the mobile GIS transmission method under the 4G terminal with high stability and strong anti-interference is adopted to realize the optimal control of mobile geographic information service under the 4G terminal and improve the cooperative control ability of mobile geographic information service transmission under 4G terminal. It is of prodigious importance to study the transmission technique of the mobile geographic information service under the 4G terminal in the design of Mobile Ad hoc NETwork (MANET) for vehicle-road collaborative control and vehicle networking [17]. This should be noted that the transmission of mobile geographic information service under 4G terminal is characterized by no stationarity and multipath, which leads to intersymbol interference and multipath, and the output stability is not good [12].

On the basis of the above assumptions and investigations, we believe that it is necessary and essential to design and suggest a transmission control model for mobile geographic information service under the background of 4G terminal, and improve the transmission stability of mobile geographic information service under 4G terminal by combining channel equalization adjustment. At present, the transmission methods of mobile geographic information service under 4G terminal mainly include transmission control method of mobile geographic information service under 4G terminal based on orthogonal frequency division multiplexing, BPSK modulation method, and PSK modulation method, etc. [18]. Through time-frequency feature analysis and equalization control, the transmission control of mobile geographic information service under 4G terminal is realized. In [19], the authors have put forward a method of mobile geographic information service and interference suppression under 4G terminal based on PTS-Clipping algorithm. In fact, the suggested method adopts piecewise fitting control method to design channel balance and suppress intersymbol interference during the transmission of mobile geographic information service under the 4G terminal, which improves the output signal-to-noise ratio and reduces intersymbol interference. However, the stability and real-time performance of mobile geographic information service transmission under 4G terminal with this method are not good.

In [3], the researchers have suggested and put forward the control method of mobile geographic information service under the background of 4G terminal with direct sequence spread spectrum. The suggested method uses direct sequence spread spectrum transmission method to transmit mobile geographic information service under 4G terminal with spatial multipath channel, which reduces the output bit error rate, but the computational load is high. A control method of mobile geographic information service under 4G terminal is proposed based on autocorrelation matching filter and adaptive association rule mining in [4]. The interference suppression and filtering analysis in the transmission process of mobile geographic information service under the 4G terminal are carried out by autocorrelation matching filter and adaptive association rule mining device. Combined with error compensation, the stability and real-time performance of mobile geographic information service transmission under the 4G terminal are improved, but the packet reception performance of this anticipated technique is significantly poor in the strong interference background [2, 20].

6. Conclusions and Future Research

In this paper, a transmission control model of mobile geographic information service under the 4G terminal is designed, and the stability of mobile geographic information service transmission under the 4G terminal is improved by combining channel equalization adjustment. This paper proposes a transmission method of mobile geographic information service under the 4G terminal which is grounded on the channel Porter interval equalization algorithm. The single copy routing algorithm (SimBet) is used to reconstruct the transmission channel model of mobile geographic information service (GIS) under the 4G terminal, and the transmission channel model of mobile geographic information service under the background of 4G terminal is constructed. Moreover, the autocorrelation matching filter and the adaptive association rule mining procedures are implemented in combination to further comprehend and understand the anti-interference design of the signal transmission.

According to the symbol characteristic distribution of the mobile geographic information service channel under the background of 4G terminal, this paper adopts: (i) the Porter interval equalization approach in order to realize the segmented equalization control of mobile geographic information service transmission under the 4G terminal, (ii) designs a channel equalization model, (iii) uses the K-means data clustering procedure to cluster mobile geographic information service data under the 4G terminal, and (iv) samples the optimal distribution interval of mobile geographic information service data time series under the 4G terminal. In fact, the distribution interval is made according to the attenuation of mobile geographic information service (GIS) transmission bandwidth under the 4G terminal in communication network, so as to improve the transmission stability of the mobile geographic information service under 4G terminal. The test shows that the suggested approach has high transmission rate, good stability and low bit error rate for mobile geographic information service under the 4G terminal. In the future, we will consider machine learning approaches to increase the learning capability of the suggested approach. Also, we will investigate the use of cloud and edge computing concepts to enhance the transmission rate and reduce the bit error rate.

Data Availability

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

Conflicts of Interest

The authors Declares that The authors have no conflict of interest.

Acknowledgments

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