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Research Article

The Impact of Volunteering in Festival on Life Rhythm: Taking Wireless Network Communication and Wearable Devices as Tools

Jie Zhang

Department of Tourism Management, South China University of Technology, Guangzhou, 510000 Guangdong, China

Correspondence should be addressed to Jie Zhang; 201410105938@mail.scut.edu.cn

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It is important to understand the impact of volunteering in festival on life rhythm of a volunteer. Little attention has been paid to the impact of volunteering on volunteers' behavior. This study is aimed at exploring volunteers' life rhythm and makes a contrast with that of everyday life by wireless devices. Related theories include volunteers' behavior, life rhythm of festival volunteers, and wearable devices. Data was collected with a wearable device for the advantage of mobility, flexibility, and instant feedback though there are obstacles such as limited bandwich, signal attenuation, and network congestion. The results show that sleep rhythm interacts with activity rhythm, and volunteering has an impact on the interaction. Volunteering takes the place of work or relaxation, so that the rhythm of sleep is different from that of daily life and is affected by both the circadian rhythm and social factors. But the waking time is advanced by social factors. Compared with other types of days, volunteer day presents the rhythm of early getting up and more time-consuming walking. The schedule in volunteering is obviously different from that of ordinary day, and the walking mileage is much higher than ordinary day. Volunteering has an overflowing effect on daily life and reduces the choice of outdoor activities after being a volunteer.

1. Introduction

Since the early 20th century, festivals enter a stage of rapid international growth [1]. Not only the size but also the number of festivals to has increased, even in times of economic downturn [2]. Volunteers play a crucial role in the sustainability and success of festivals and have been called the "third force" in festival management [3]. They can help offset the cost of a festival [4], expand the quality and diversity of services in the festival [5], and contribute to the social and cultural impacts of a festival while fulfilling their work in the festival [5, 6].

The concept of volunteering emphasizes on its altruistic, voluntary, and organized aspect [7]. They are willing to achieve the balance of social and individual value in volunteering [8]. The literature of volunteer management involves recruitment management, selection and training, incentive, feedback, assessment, and evaluation [8]. For example, volunteers' experience has an impact on their intention to reparticipate [9], and recruitment of a volunteer is related to motivation and organizational commitment [10]. Volunteers in China are mainly college students, while volunteers in foreign sports events are mainly amateur sports enthusiasts or volunteer organizations. Therefore, the management of volunteers in China and abroad is in different ways [11]. There are defects in human resource management, financial management, and evaluation system, such as the lack of stable management team, scientific evaluation, and reward system, unable to provide effective professional training [7]. Volunteers and officials were thought to be managed differently [12], and regulations and incentive mechanism of volunteers should be improved [13].

Volunteering in festival has significant impact on volunteers themselves. Previous research focused on the impact of volunteering on the spiritual aspect of the volunteer in the festival, such as promoting self-development [14], self-identification [15], and civic awareness [16]. Little attention has been paid to the impact of volunteering on volunteers' behavior. Volunteering is a way to spend their nonwork time. Behavior of volunteers in festival was influenced by intrinsic motivation, satisfaction, social capital, task overload [17, 18], and work climate [19]. But there is no research on the impact of festivals on volunteers' life rhythm.

There are many methods in wireless transmission, and the appropriate transmission must be selected based on the application background and technical maturity. Wireless networks suitable for long-distance transmission include cellular networks, microwave, and satellite communication networks. Wireless networks suitable for short-distance transmission include 802.11 networks, UWB networks, and Bluetooth. Tourism activities and the interaction between the behavior of tourists and the physical environment have always been one of the important areas of tourism geography research [20]. Research on macroscopic spatial scales of behavior tends to regard tourism activities as discrete and explicit behaviors [21, 22]; nevertheless, it neglects the impact of psychological factors on the decision-making process of behavior.

Wearable technology mainly explores technology that can be directly worn on the body or integrated into the user's clothes or accessories. Smart Wearable devices have been applied in industries such as tourism, sports, and fitness for that they can record and store the data generated in the process of travel and sport. The structured and unstructured data are often more objective and realistic than traditional on-site survey data [23]. Thus, it may be used by volunteers to record the data while volunteering.

The rhythm analysis theory was formed by the French philosopher Henri Lefebvre to demonstrate the relationship between time and space [24]. Rhythm analysis can be used as a method to diagnose the rhythm of daily life, especially the rhythm disorders [25]. The relationship between rhythm and daily life is aimed at integrating rhythm with daily life [26]. This intervention has a goal—to reconstruct the "prosody of the rhythm" [26]. Body is the bearer of life rhythm and connects the society and nature. It is the way to understand rhythm and carry out rhythm analysis. Luckily, with the development of science and technology, there are more ways to detect the body. Of which, wearable devices attract more attention.

Time geography is a methodology for expressing and interpreting the relationship between human spatial behavior and objective constraints in spatial processes [27]. Through the combination of space and time dimension, a three-dimensional space-time system is constructed to show how individuals move in space-time environment and explain the behavior process through concepts such as time, space, space-time path, territory, and space-time prism [28, 29]. It has been used in tourist behavior but not been used in volunteer behavior.

With the purpose of exploring the impact of volunteering on behavior and life rhythm of a volunteer, the research contrasted behavior and life rhythm in volunteering and in daily life. Based on a natural day-based statistical unit, the study divides the data into voluntary day and ordinary days, using wearable devices (Millet bracelet) to obtain research data about individual behavior and explore the relatedness of ordinary life and volunteering.

2. Proposed Method

2.1. Literature Review Method. To gain a comprehensive and correct understanding of the current state of research, the literature review of festival volunteers with wearable devices is conducted by examining the festival volunteers and wearable devices in relevant literature. Meantime, the literature research method is used to obtain a comprehensive literature on circadian rhythm, activity rhythm, volunteer behavior, rhythm analysis theory, and time geography theory, as well as daily life and volunteering. The operating mode of the wireless communication network is shown in Figure 1.

2.2. Data Acquisition Method

2.2.1. Observation Method. The observation method is a common research method, and it is widely used because of its operability and flexibility. In order to understand the status quo and characteristics of festival volunteers' life, the practical observation method must first set the research purpose, list the research outline, make an executable observation table, and use the senses and other auxiliary tools, such as cameras and voice recorders. Observing is not just a simple look; by listening and using it well, it helps to expand the perceptual knowledge of the topic and lead to new discoveries. The basic architecture of the wearable device is shown in Figure 2.

2.2.2. Wearable Device (Millet Bracelet) Activity. A wearable device is more than just a hardware device. It also implements its powerful functions through software support, data interaction, and cloud interaction. Such devices can be comfortably worn by the user and function to extend the perception, monitor the state, and improve the work efficiency.

2.2.3. Log Investigation Method. Based on the log recorded by the portable device and the objective supplement of the researcher, an objective data about the behavior of a volunteer has been acquired. The log survey method has been widely used in the study of activities, and it is one of the most effective methods to collect individual activities and data about time and space. The respondents filled out the questionnaire according to the activity time automatically divided by the Millet bracelet, and information such as the start and end time, content, location, and status of the respondent on the daily recorded behavior during the investigation period was obtained.

2.3. Data Analysis Method. Because festival activities have the characteristics of short duration, fixed period, and large number of tourists, a large number of volunteers with high quality need to be recruited during the festival activities.

2.3.1. The Principle of the Levene Test. In terms of time to go to bed, being awake, and total voluntary time, judging from

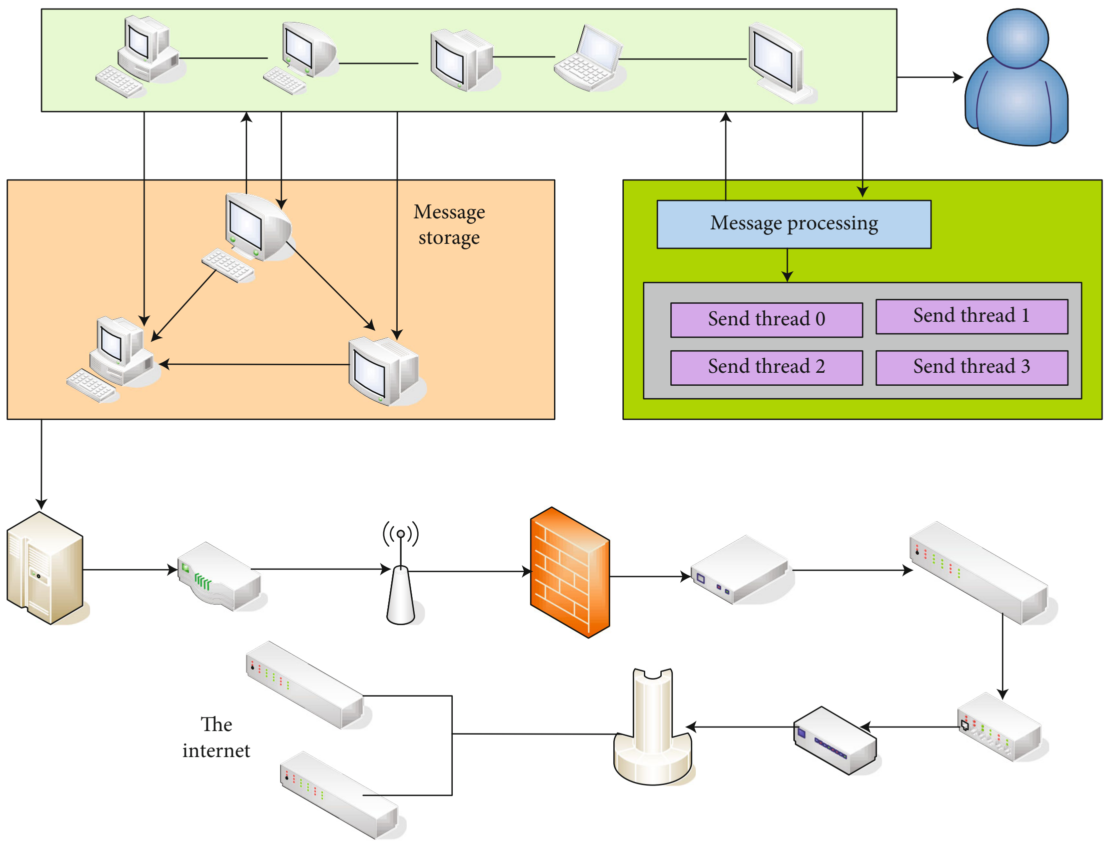

Figure 1: The operating mode of the wireless communication network.

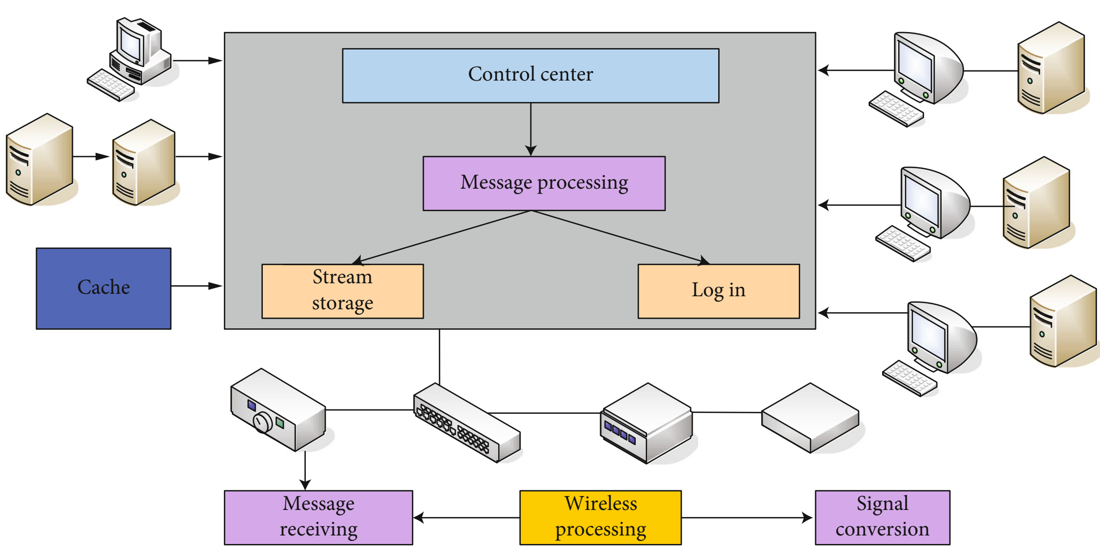

Figure 2: The basic architecture of the wearable device.

the number of days of providing volunteer services, their volunteer services are usually on Fridays and weekends. For example, whether to participate in voluntary activities, the morning wake-up time, lunch time, and end time of the volunteer day are all affected by the social contract and social rhythm.

(1) The test hypothesis $H_0 : \sigma_1 = \sigma_2 = \cdots = \sigma_k$ means that the variances of the processing groups are the same; $H_1 : \sigma_i \neq \sigma_j$; the variances of the processing groups are not all the same. $\alpha = 0.05$ or $\alpha = 0.01$

(2) Calculate the test statistic W value:

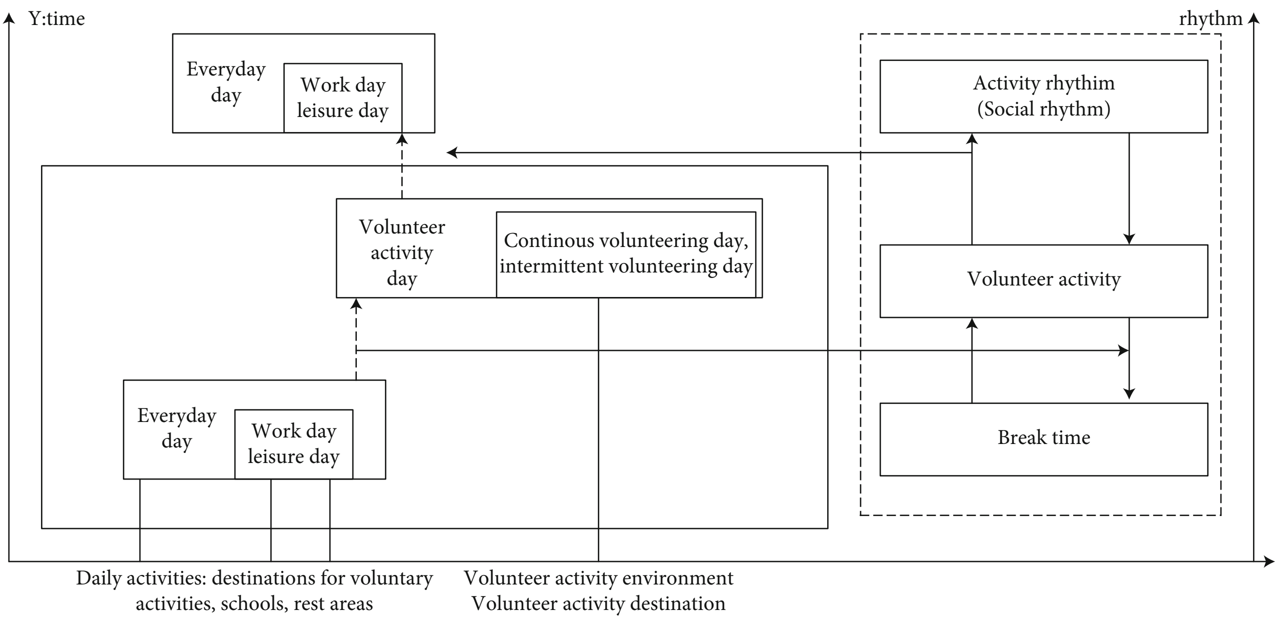

Figure 3: Theoretical framework for the study of a volunteer's life rhythm.

$$w = \frac{\left(N - k\sum_{i=1}^{k} N_i \left(\bar{Z}_i - \bar{Z}_{\ldots\ldots}\right)^2\right)}{(k-1)\sum_{i=1}^{k}\sum_{j=1}^{i}\left(\bar{Z}_{ij} - \bar{Z}_{i.}\right)^2}, \quad (1)$$

where W is the test statistic, k is the number of sample groups, N_i is the content of the i-th sample, N is the sum of the sample contents, Z_{ij} is the new variable value after the original data is converted by the data, and Z_i is the first. The mean Z of the i samples is the total mean of all the data.

$$Z_{ij} = \frac{(W + n_i - 2)n_i\left(x_{ij} - \bar{x}_i\right)^2 - W(n_i - 1)s_i^2}{(n_i - 1)(n_i - 2)}, \quad (2)$$

where W is generally taken as 0.5, which can be used to adjust the peak value of the data distribution.

Then, use the following formula to calculate the F value of the test statistic, and find the conclusion of the F-boundary value table with the corresponding degrees of freedom:

$$\begin{aligned} F &= \frac{(n-k)\sum n_i(\overline{z_i} - \bar{z})^2}{(k-1)\sum\sum\left(\overline{z_{ij}} - \bar{z}_i\right)^2}, \\ B_{xy}(\tau) &= \frac{1}{M-N}\sum_{n=1}^{N-\tau}\left(\frac{X_n - \bar{x}}{\phi_x}\right), \\ \phi_{xy}(F) &= \frac{\left|H_{xy}(F)\right|^2}{\left|\{H_{xx}(F)\}\right|H_{yy}(F)\right|}. \end{aligned} \quad (3)$$

Vigorously promote the concept of voluntary service, create a good social atmosphere, and guide more teachers and students to participate in voluntary service.

$$G_{v2} = \frac{L}{H_k^2} = \frac{2N}{L(L-1)}, \quad (4)$$

$$\phi = \Re\sum_{i=1}^{n}\chi, \quad (5)$$

where $n = n_i$ and K is the number of samples.

2.3.2. The Principle of Kruskal-Wallis Analysis. Square sum difference:

$$S_E^2 = \sum_{i=1}^{k}\sum_{j=1}^{n_i}\left(x_{ij} - \bar{x}_i\right)^2. \quad (6)$$

Squared difference between groups:

$$\begin{aligned} S_A^2 &= \sum_{i=1}^{k} n_i(\bar{x}_i - \bar{x})^2, \\ U &= \frac{1}{M(M-1)}\sum_{i,U} L_{ij}, \end{aligned} \quad (7)$$

$$\phi = G - \frac{6\sum D_i^2}{N^3 - N}, \quad (8)$$

$$R = \|G - JG\|^2 + \kappa\|M\|^2, \quad (9)$$

$$B = F^T\left[RK^T + \kappa\pi\right]^+. \quad (10)$$

Figure 4: Millet bracelet activity data.

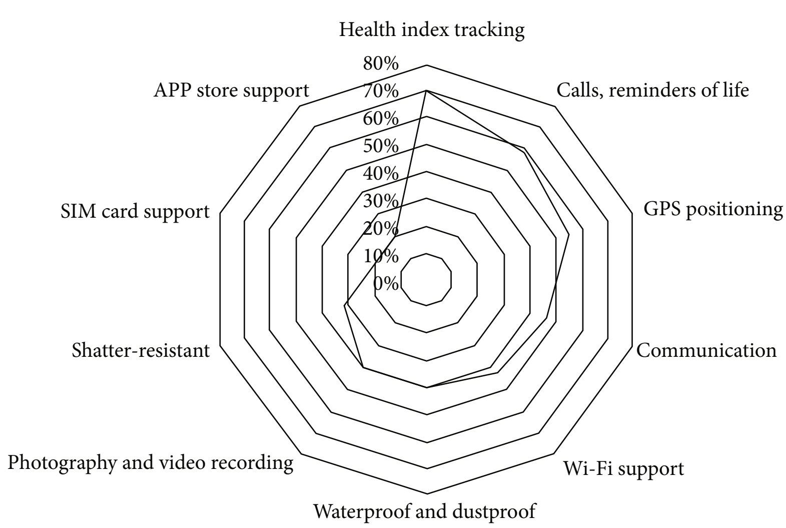

Figure 5: Researchers' interest in the various functions of wearable devices.

Total deviation squared sum:

$$S_T^2 = \sum_{i=1}^{k}\sum_{j=1}^{n_i}\left(x_{ij} - \bar{x}_i\right)^2,$$
$$S_T^2 = S_A^2 + S_E^2,$$
$$\phi_j = H, H \in R^{(5N\nu)\times(5N\nu)}. \quad (11)$$

Volunteer service activities during the festival, as an important form of activating the cultural life of teachers and students during the festival, as a major event to promote the normalization of civilization, place an important position and plan carefully.

$$H_\Phi^N = YH, \quad (12)$$

$$G_j = G^T\left[GG^T + \alpha G\right]^{-1}M,$$
$$S_j = R = M^T\left[LK^T + LH\right]^{-1}G. \quad (13)$$

If there is a difference between the populations, the difference between the groups should be large, so the test statistics can be taken.

$$F = \frac{S_A^2/(k-1)}{S_E^2/(N-k)} = \frac{\sum_{i=1}^{n} n_i(\bar{x}_i - \bar{x})^2/(k-1)}{\sum_{i=1}^{k}\sum_{j=1}^{n_i} n_i\left(x_{ij} - \bar{x}_i\right)^2/(N-k)},$$
$$E = \sum_{i=1}^{p} B_i Y_{(t-i)} + \sum_{i=1}^{p} N_i M(T-E) + BQ_t + \varepsilon_t. \quad (14)$$

While volunteers bring care to the society, they also spread love and civilization.

$$F_t = \sum_{i=1}^{p} N_i{}' T_{(t-i)} + \sum_{i=1}^{p} J_i{}' X_{t-i} + D' Y_t + \phi_t{}',$$
$$F(r) = \phi \times R^3 \exp\left(-\frac{R}{AB}\right). \quad (15)$$

When the null hypothesis is established, $F \sim F(k-1, n-k)$; p value is defined as $P(F > f)$.

$$T_i = \sum_{m=1}^{M} Q_m T_m \phi_{mi}, \quad (16)$$

$$M_m = \frac{G_m}{G}\left(\sum_{m=1}^{N} G_m = 1\right). \quad (17)$$

2.3.3. Mathematical Statistics Analysis. A mathematical model analysis method refers to the research method of using mathematical symbols and numerical formulas to study and express processes and phenomena in the process of analysis. This analysis method can make the expressions of processes and phenomena research more concise and clear, its reasoning is more intuitive, convenient, and precise, and the theoretical framework is more organized. This paper uses the SPSS22.0 software package for mathematical statistics analysis. Frequency statistics, descriptive statistics, cluster analysis, analysis of variance, and correlation analysis have been used in this study.

Table 1: Statistical survey of types of wearable devices.

The type of wearable devices	Number of people	Percentage
Smart phone	30	10.2%
Smart watch	22	7.5%
Heart rate belt	4	1.4%
Mobile app	174	59.2%
Other devices	8	2.7%
Not used	80	27.2%

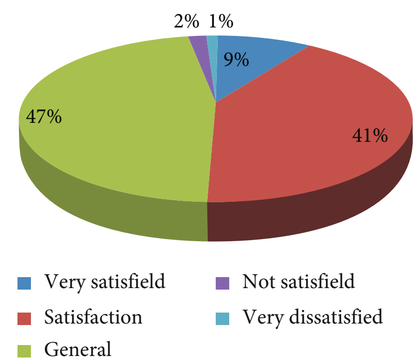

Figure 6: The satisfaction of the wearable device.

3. Experiments

3.1. Related Theory

3.1.1. Wearable Devices. So far, there has been no universal definition of wearable devices. It is literally understood to be directly worn on the body or can be understood as a portable computer device that can transmit personal information close to the body [30]: a Wearable device can bring a qualitative leap to our future life through the interconnection with software, greatly improving the quality of our lives. In addition, wearable devices can also be embedded in clothing, as well as electronic communication smart devices of the same size as imaging accessories. Not only can the user wear more comfort but also it can monitor the user's perception. These devices integrate cutting-edge technologies such as multimedia, wireless communication technology, microsensors, GPS positioning systems, flexible screens, biometrics, and virtual reality. In addition, these devices can collect, process, share, and feedback all information related to the human body anytime and anywhere by combining big data, cloud computing, and the like.

Introducing wearable technology into the field of individual behavior is an inevitable trend of technology development and people's pursuit of a perfect experience [31]. Currently, the common wearable devices on the market include smart glasses, smart watches, and smart bracelets.

Table 2: Variance analysis results of differences between life types.

Life type	Sleep	Wake up	Fall asleep	Active time	Walking mileage (m)	Calorie consumption (kcal)	Total walking time
Working day	0:03	7:17	0:05	1008.14	5367.37	359.64	46.31
Short travel in leisure day	0:43	8:13	0:50	997.37	7863.54	345.87	307.54
Necessity for life	0:12	8:19	0:20	840.51	4853.89	268.34	127.64
Do not go out doors	0:32	8:37	0:45	968.52	1784.54	86.34	15.78
Continuous volunteering day	21:26	6:06	21:29	919.97	14058.64	558.97	541.34
Intermittent volunteering day	22:02	6:27	22:08	941.98	136037.84	537.64	510.03
F	21.375	25.334	31.821	17.154	851.145	37.145	308.124
Sig	0.004	0.000	0.036	0.000	0.000	0.000	0.000

Also, some of them can provide users with an immersive experience. Wearable devices, suitable for connecting people and physical environment, contribute to the digitization of the human body, creating a full service platform [32, 33]. A wearable device has been used to monitor activity and schedule: activity monitoring includes counting steps, calculating calories burned, and monitoring activity trajectory, and schedule monitoring includes monitoring sleep, heartbeat, and blood glucose [42]. The wearable device has been used in detecting movement [43], caring for the elderly, and rehabilitating [44].

Table 3: Homogeneity test of variance.

	Levene statistics	df1	df2
Sleep	3.223	7	2664
Wake up	20.336	7	2668
Fall asleep	3.236	7	2468
Active time	2.236	7	2246
Walking mileage (m)	262.032	7	2164
Walking consumption (kcal)	2.236	7	2128
Total walking time	223.323	7	2128

3.1.2. Theory of Rhythm Analysis. "Rhythm analysis," put forward by Lefebvre, is part of space production theory [34]. Time and space are key concepts in understanding individual behavior. Lefebvre combined them through "rhythm analysis" and thought it as necessary to understand the interrelationship between space and time in understanding everyday life [35]. The existence of those rhythms is manifested through mediation or indirect influence, and even "rhythm analysis" may eventually replace psychological analysis [36].

There is scarcely research on tourist or volunteer behavior from the perspective of Lefebvre's rhythm analysis. By summarizing the existing literature, we can find that the research on this topic can be divided into two groups: a school of researchers aim at interdisciplinary application of rhythm analysis. Hopwood applied rhythm analysis to pedagogy and pointed out that there are multiple complex rhythms in rhythm and pedagogy [37]. The rhythm analysis of learning outcomes is a new problem [38]. Borch et al. applied rhythm analysis to financial research and pointed out that traders have to explore how to adapt their body rhythm to the market rhythm [38]. Hetherington used rhythm analysis to urban studies and pointed out that it has great significance for mobility and spatial layout [39]. The other school of researchers applied rhythm analysis in practical cases. Verduyn used rhythm analysis to analyze the entrepreneurial process and believed that the entrepreneurial process is open and uncertain, and entrepreneurship has a positive intervention on the rhythm of daily life [40]. Lagerkvist believes that the rhythm of new Shanghai found by tourists is the multiple rhythms of vigorous development and chaos, while the nostalgia industry reminds tourists of the golden age of old Shanghai [41]. Thorpe proposed that, by using rhythm analysis, natural disasters have impact on individuals' body and daily mobility [42]. Thus, rhythm analysis has been used in exploring individual' daily life but has not been used in the impact of volunteering on volunteers' life.

3.1.3. Time Geography. Time geography theory had been applied to the study of tourist behavior. Scholars have strengthened the time-space fusion thinking including space-time integration. It has changed the perspective of tourist behavior research, highlighting the microindividual time and space behavior of tourists and exploring the law through individual tourists' time-space behavior and movement. Taking time and space as the equally important resources and limiting factors in the behavioral scale, it provides a new research method for interdisciplinary and cross-disciplinary actions, solving practical tourism problems. According to research content and technical methods, foreign research has gone through the following stages [43].

The first phase was the initial application phase (1985s to 1995s). With the continuous deepening of tourism research on space issues, the time dimension becomes more and more necessary, and the concept of time geography gradually infiltrates into tourism research. The second phase is the phase of the research perspective (1995s to 2005). The description of the overall behavioral characteristics of tourists is not enough to solve specific problems such as tourism destination planning and tourism route design. The research shifts from macrofeature analysis to microindividual research. The third stage is the stage of innovation and diversification of theoretical and technological methods (2005-present).

Table 4: Kruskal-Wallis analysis of nonparametric tests.

	Hypothesis	Sig	Decision
1	The distribution of sleep start values is the same in all life types	0.001	Reject
2	The distribution of waking time values is the same in all life types	0.000	Reject
3	The distribution of sleep duration values is the same in all life types	0.009	Reject
4	The distribution of activity time of one day is the same in all life types	0.000	Reject
5	The distribution of walking mileage is the same in all life types	0.000	Reject
6	The distribution of walking consumption is the same in all life types	0.000	Reject
7	The total time of walking is the same in all life types	0.000	Reject

Table 5: Analysis of the rhythm of life after volunteering.

	After the volunteering	Type of volunteering	Numbers of days volunteer	Start of sleep	Time to wake up	Sleeping hours	Duration of activity	Walking mileage	Walking consumption
After the volunteering		0.043	0.011	0.013	0.034	0.033	0	0.033	0.113**
Type of volunteering	0.043		0.336**	0.101	-0.033	0.034	0.014	-0.166**	-0.033
Numbers of days volunteer	0.011	0.336**		0.110**	0.041	0.033	0.143**	-0.101**	-0.114*
Start of sleep	0.013	0.101	0.110**		0.311**	-0.03	0.441**	-0.113	-0.043
Time to wake up	0.034	-0.033	0.041	0.311**		0.466**	-0.661**	0.143**	0.193**
Sleeping hours	0.033	0.034	0.033	-0.03	0.466**		0.133**	0.163**	0.131*
Duration of activity	0	0.014	0.143**	0.441**	-0.661**	0.133**		0.110**	0.033
Walking mileage	0.033	-0.166**	-0.101**	-0.113	0.143**	0.163**	0.110**		0.662**
Walking consumption	0.113**	-0.033	-0.114*	-0.043	0.193**	0.131*	0.033	0.662**	

With the improvement of human observation perspective and the development of technologies such as ICT and GIS, time geography has experienced the development of theory and methodology, mainly from focusing on physical space behavior to establishing a conceptual framework of the relationship between matter and virtual space and strengthening the emotion in behavior. Factor considerations, innovative methods of spatial, and temporal data processing and expression of individual behaviors [44] objectively promoted the theory and method innovation of tourist behavior research.

3.2. Theoretical Framework for the Study of the Life Rhythm of a Volunteer Based on Time Geography. This study defines ordinary day and voluntary days based on rhythm analysis theory and time geography and divides ordinary days into working days and leisure days. At the same time, according to the time span, the volunteering is divided into continuous volunteering and intermittent volunteering.

Ordinary day performance is the conversion of activities between individuals at home (residence), work place, and daily leisure places such as shopping malls in a habitual environment, Work activities (learning activities) occur as or not is the main criteria for dividing ordinary days into working days (study day) and leisure day. Based on the analysis of daily activities, the natural circadian rhythm of a day is mostly manifested in sleep activities, and the social rhythm is the rhythm of individual activities (including work, life, and leisure). Rest and activities interact and restrict each other (Figure 3).

3.3. Experiment Design

3.3.1. Survey on the Popularity of Festival Volunteers and Wearable Devices. A questionnaire survey was conducted on festival volunteers using smart wearable devices to participate in tourism activities. A total of 538 questionnaires were distributed, and 494 valid questionnaires were returned. The effective questionnaire recovery rate was 91.8%. The reliability test of the questionnaire was carried out by retesting. The reliability coefficient of the questionnaire was 0.892. And the validity test was more effective after using the expert test.

3.3.2. Investigation on the Impact of Daily Activities on Life on Wearable Devices. According to the above survey, select appropriate respondents and unify wearable devices (Millet bracelet and mobile app) for further testing. In this paper, 32 respondents with matching activity log and Millet bracelet data are selected. The physiological rhythm and activity rhythm of festival volunteers are constrained by gender, age, and group specificity. In addition, in the process of judging the leisure day, the location (home/school) of the

Table 6: The terminal system DDR resource allocation that the data business software designed in this text runs.

Buffer type	Size	Initial address	End address
ARM	128 M	0x80000000	0x87FFFFFF
DSP code	2 M	0x88000000	0x881FFFFF
DSP data	32 M	0x88200000	0x8A1FFFFF
Video capture V4L2 buffer area	20 M	0x8A200000	0x8BSFFFFF

respondent is distinguished, and the purpose is to study whether there is a difference in the choice of activities in the long-term and short-term leisure life.

Combine the Millet bracelet data with the activity log. On the one hand, it helps the participants to fill in the activity log, avoiding relying on their own memories and judgments to record the data of the day, thus improving the accuracy of the activity log data. On the other hand, the data type provided by the Millet bracelet is matched with the experimental research needs, and the use of the characteristics of being easy to wear and easy to operate by the subject is convenient for data acquisition of long-term behavioral experiments.

The individuals received the Millet bracelet, downloaded the Millet sports mobile app, completed the matching mobile phone, and checked the application status. During the investigation period, wear the Millet bracelet 24 hours a day (except for bathing, swimming, etc.), and try to use the various functions of the Millet bracelet to ensure that the bracelet is in normal working condition (timely charging, checking equipment work). Use the phone screen capture to save all data for the day before going to bed. Fill in the activity log Excel questionnaire to record the city, the participating activities, the event location, and other information (Figure 4).

Table 7: The allocation of each shared buffer area.

Buffer type	Number of buffers	Buffer size (byte)
Video capture buffer area	20	1 M
Audio capture buffer area	40	6400
Audio coding stream header buffer area	2230	32
Audio coding stream data buffer area	2230	320

Table 8: Measured packet loss recovery rate.

Traditional Cauchy RS code Serial number	1	2	3
Packet loss rate	1%	2%	3%
Recovery rate	0.899	0.815	0.745

Table 9: The measured packet loss recovery rate in the optimized quadratic Cauchy RS coding algorithm under different packet loss rate environments.

Optimized algorithm Serial number	1	2	3
Packet loss rate	1%	2%	3%
Recovery rate	0.92	0.9	0.88

4. Results and Discussion

4.1. Characteristics of the Volunteer Group Based on Wearable Devices. The most interesting feature for users of wearable devices is health indicator tracking, which accounts for 71%, followed by calls, life reminders, and GPS reminders. As can be seen from Figure 5, the functions that the user is interested in are usually functions that are not replaceable by the current smart phone and are unique to the wearable device. This shows that the wearable device that the user needs is not a mobile terminal that can replace the mobile phone, but a wearable device that can realize the functions that the existing smart terminal cannot implement.

4.2. Analysis of the Use of Smart Wearable Devices in Volunteers Working in the Festival. The survey found (Table 1) that 72.8% of festival volunteers use smart wearable devices during volunteering. Further comparison found that festival volunteers wear smart wear device rankings from high to low for mobile app, smart bracelet, smart watch, other devices, and heart rate belt. In these devices, the smart phone sports app software is the most important way for festival volunteers to use smart wearable devices (59.2%). The reason is that with the rapid development of mobile internet technology, mobile terminal devices represented by smart phones have been widely popularized in people's lives, making mobile smart phones the world's largest mobile intelligent terminal, which is quietly changing people [45].

4.3. Analysis of Volunteer Activity Satisfaction for Wearable Devices. As can be seen from Figure 6, the survey found that testers who used smart wearable devices on the voluntary day had better satisfaction with the above-mentioned volunteer, accounting for 50.5%, while the proportion of poor and very poor satisfaction was small (only 2.8%). This means that smart wearable devices have a high degree of recognition and good satisfaction with the use experience, reflecting that the use of smart wearable devices can effectively promote volunteer's enthusiasm for volunteering. The main reasons for speculation are as follows: first, the smart wearable device can provide feedback information to the volunteers in time, and the volunteer is attracted by the analysis data of the smart wearable device to promote a benign cycle;

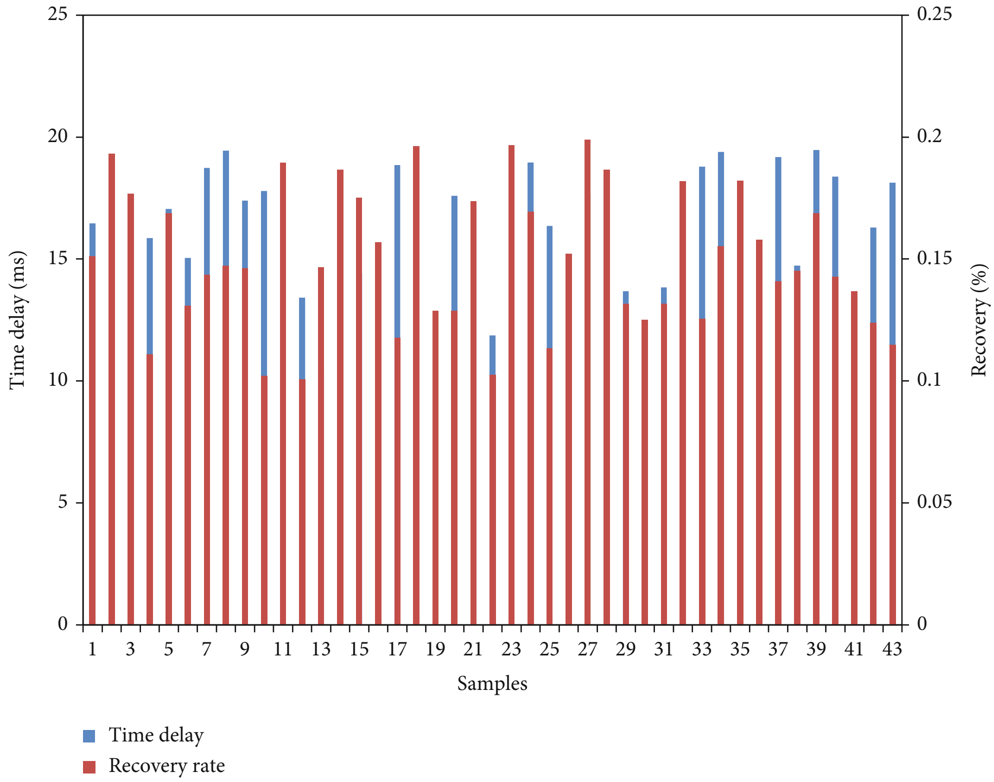

Figure 7: The recovery rate of the optimized algorithm under different packet loss rate environments.

second, the smart wearable device management has a social circle platform. Like-minded volunteers release their data in the social circle, which allows the sharer or founder to reap the joy of success.

4.4. Rhythm Difference Analysis. The daily sleep start, awake time, sleep time, daily activity time, walking mileage, walking consumption, and total voluntary time of the subjects were analyzed by variance analysis according to the type of life to compare the daytime differences. Among them, the daily sleep time is the sleep start time of the next day; the sleep start, wake time, and sleep time are numerically processed because of the time scale involving the cross day. The duration of one day of activity, that is, the time of removal of sleep within one day, indicates the time constraint of the rhythm of physiological activity on the rhythm of social activities. The total length of volunteering is the round-trip time of the outbound activities, including the transportation or walking time on the way back and forth; the other records are data for the Millet bracelet. The results are analyzed in Table 2.

There is significant difference in the F-statistics of the items of time to sleep, wake up, falling asleep, walking mileage, and calorie consumption. The active time and the total walking time passed the significance test.

However, according to the homogeneity test of the variance of Table 3, it can be seen that indicators are not tested by the homogeneity of variance. In order to ensure the accuracy of the variance test, the relevant data is processed logarithmically, and the result is the same as the previous one. Therefore, the nonparametric test was selected for analysis, and the SPSS19.0 software package brought the same results as the analysis of variance (Table 4). The results of sleeping time, waking time, daily activity time, walking mileage, walking consumption, and total walking time reject the null hypothesis; that is, the distribution has significant differences among different life types.

The analysis results of the other party's difference and the results of the nonparametric test are analyzed. The results are as follows:

(1) The sleeping time of a volunteer is controlled by both circadian rhythm and social context. The sleeping schedules change during the volunteering. Volunteering in the festival has the characteristics of long working hours, heavy working intensity, and high-quality requirement. With the purpose of curing tiredness and restoring vigor, volunteers have to go to bed and get up earlier; they sleep more in volunteering life. Thus, sleeping is subject to constraints of volunteers' circadian rhythm. Besides, volunteering is a work more complicated and heavier than other work; volunteers have longer sleeping hours and go to bed earlier. Thus, the sleeping schedule in volunteering life is different from that in ordinary life; both the circadian rhythm and social rhythm work on it

Table 10: The module composition of the device.

Serial number	Module name
1	Arduino MEGA2560 development board
2	BLE-Link Bluetooth 4.0 module
3	Arduino Xbee sensor expansion board IO expansion board V7
4	PTB301 CDMA module
5	Beidou system module
6	ZigBee wireless sensor node

(2) Volunteering has a great impact on their life rhythm. When volunteering, volunteers get up at six in the morning, work until six in the evening, and go to bed at 9 o'clock; when resting, they get up at nine and does not go to bed until one in the morning. Volunteers may not go out or have any movement on the rest day, except for eating. It shows a kind of retaliatory rest, volunteers were tired in volunteering, and some guides may walk up to 20 kilometers in one day

(3) The duration of the activity indicates both the magnitude of the restraining effect of the sleep rhythm on the activity and the degree to which the activity can adjust the body movement

According to the analysis of variance, volunteers show great differences in life between volunteering and resting. Volunteers are healthy and normal, eat regularly, and sleep long hours. Rest days and working days are a kind of compensation for the volunteering day.

4.5. Differences in the Rhythm of Voluntary Life and the Impact of Daily Life Spillover. It can be seen from the above results that there is a certain difference between the life rhythm of volunteer day and ordinary day. The data of the days after the volunteer is marked and extracted, and the correlation analysis of the research parameters is carried out. The results are shown in Table 5.

4.5.1. Volunteer Work Has Obvious Diffusion and Spillover Effects on Rest. There is no significant correlation between the parameters after volunteer service and sleep rhythm (sleep start value, sleep awake value, and sleep time value) and activity rhythm (daytime activity time, walking distance, walking consumption, and total travel time). However, on the first day after the end of the volunteer service, the tendency of volunteers to choose "do not go out of door" is more obvious. On the first day after the end of voluntary service, volunteers try to minimize going out to recover their body, and then volunteer service life may be more affected by the rhythm of social life.

4.5.2. The Influence of Volunteering on the Life Rhythm after Volunteer Service Depends on the Type of Volunteers. Volunteers are divided into different groups according to whether they work for the PCFLC continuously or not. Some of them work for the PCFLC for a month without rest, and others work two to four days a week. It depended on the number of visitors and the organization's request. The period used for recovery differs in these two groups. Volunteers who work continuously are harder to recover from volunteering than those who work intermittently. This is mainly because intermittent volunteers, having gone through several cycles of work and volunteering, can more easily return to ordinary life.

4.5.3. Sleep Rhythm Has a Binding Effect on the Rhythm of Activity. The daily activity duration has a significant positive correlation with the sleep start value and the sleep time value (0.441∗∗, 0.133∗∗) and has a significant negative correlation with the sleep awake value (-0.661∗∗) and has a significant positive correlation with walking mileage (0.110∗∗). The sooner you sleep, the later you wake up and the shorter the time you can travel on the day. The sleep rhythm restricts the activity rhythm through the activity duration and activity consumption. Meantime, the results of the correlation analysis are consistent with the results of the analysis of variance. The sleep rhythm is more controlled by the circadian rhythm. There is no significant fluctuation after

Table 11: Arduino MEGA 2560 development board's specifications.

Parameter	Index value
Output current of each I/O port	40 mA
SRAM	8 KB
Operating voltage	5 V
3.3 V regulated output current	50 mA
Input voltage range	6-20 V
EEPROM	4 KB

Table 12: The technical specifications.

Parameter	Index value
Bluetooth chip	TI CC2540
Data rate (maximum)	1 Mbps GFSK
Sensitivity	-93 dBm
Range of working temperature	-40°C~+859°C
Working frequency	2.4 GHz
Modulation or protocol	Bluetooth low energy (V4.0)

Table 13: The parameters of the C202 module.

Parameter	Index value
Way of working	CDMA20001X, support CDMA EVDO 3G uim card
Frequency band	800 MHz
Sending frequency	824.04 MHz-848.97 MHz
Receiving frequency	869.04 MHz-893.97 MHz
Maximum transmit power	200 mW (23 dBm)
Connection method	58-pin stamp hole

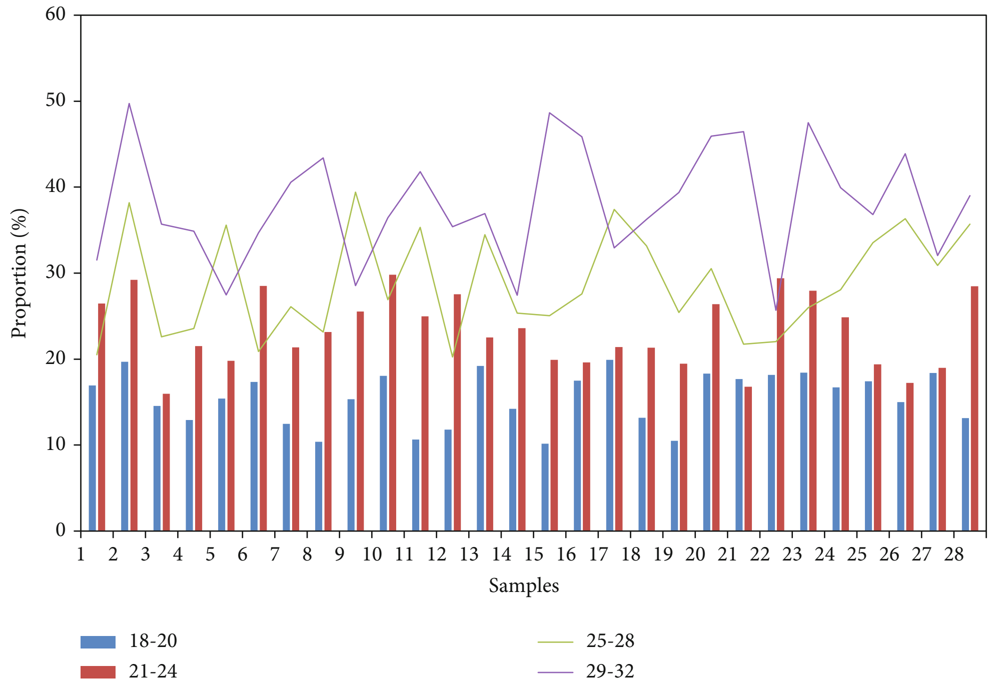

Figure 8: The survey object.

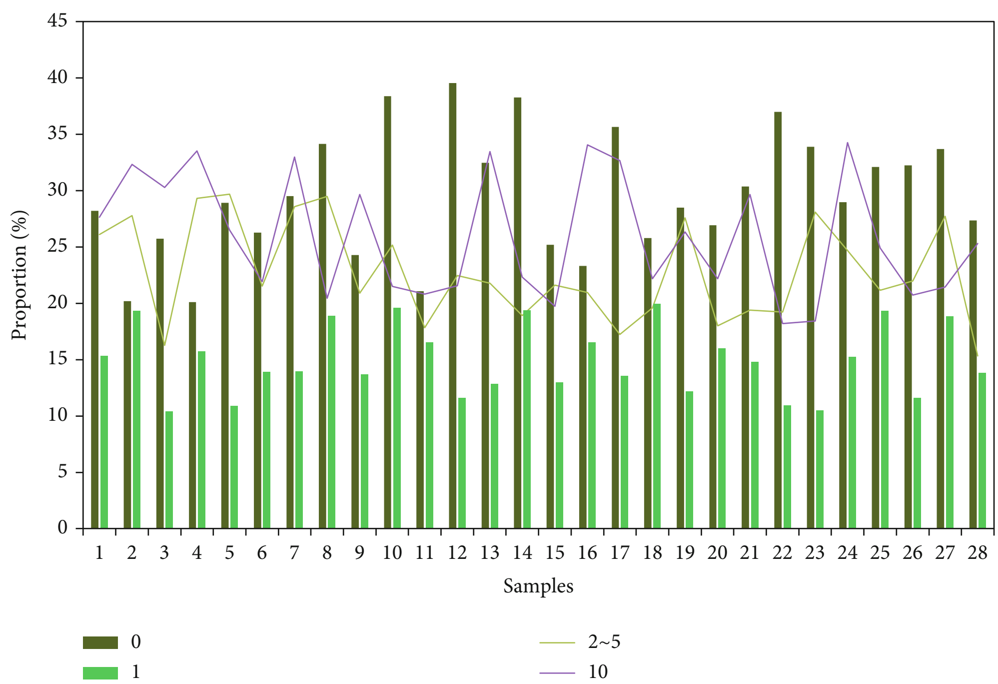

Figure 9: The frequency of use of wearable devices.

the tourism, and there is no significant correlation with the type of tourism and the number of days of tourism.

The terminal system DDR resource allocation that the data business software designed in this text runs is shown in Table 6.

The allocation of each shared buffer area is shown in Table 7.

In the traditional Cauchy RS coding algorithm under different packet loss rate environments, the measured packet loss recovery rate is shown in Table 8.

In the optimized quadratic Cauchy RS coding algorithm under different packet loss rate environments, the measured packet loss recovery rate is shown in Table 9.

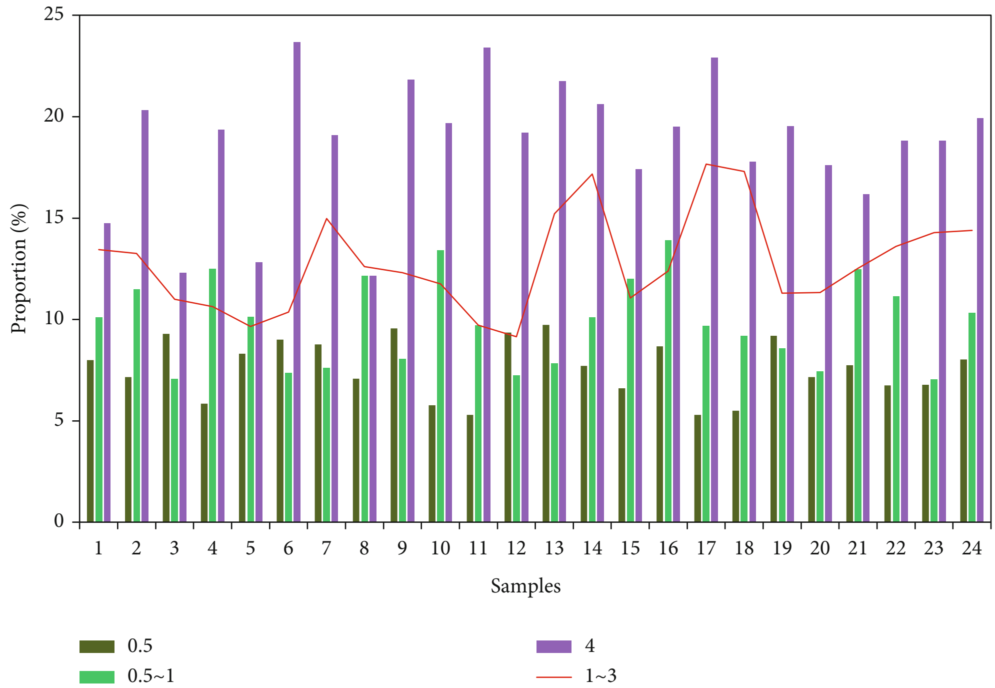

Figure 10: The time of each use of the wearable device.

In an environment with a packet loss rate of 2%-6%, the algorithm introduces a delay while the recovery rate of the packet loss is also improved, but in the case of a packet loss rate of more than 7%, the algorithm introduces a delay while losing packets. The recovery rate begins to drop, because when the number of lost packets is too much, the algorithm needs to continue to decode twice. The recovery rate of the optimized algorithm under different packet loss rate environments is shown in Figure 7.

The module composition of the device is shown in Table 10.

The Arduino MEGA 2560 development board is the main control development board based on ATmega2560, and its specifications are shown in Table 11.

At the same time, because the module can not only debug BLUNO through AT commands but also update the BLE chip program through USB, this makes development more free. The BLE-Link module is plugged into the Arduino controller using the XBEE base to achieve Bluetooth wireless control. The technical specifications are shown in Table 12.

The core structure of the PTB301CDMA module development board is the C202 module, which fully supports China Telecom's CDMA and 3G numbers. The parameters of this module are shown in Table 13.

The main purpose of this research is to explore the app service application of wearable devices and the consumer satisfaction of its users. After three months of questionnaires, a total of 220 valid questionnaires were collected, of which 139 were males and 81 were females. The survey object is shown in Figure 8.

The frequency of use of wearable devices is shown in Figure 9.

Table 14: The results of factor analysis of variance.

Model	Sum of square	df
1		
Residual	94.813	1
Total	124.187	218
Return	219.000	219
2		
Residual	111.482	2
Total	107.518	217
Return	219.000	219

The time of each use of the wearable device is shown in Figure 10.

Use regression analysis method to test the data. When performing regression analysis, first analyze the problem of multicollinearity. The problem of multicollinearity refers to the serious linear correlation between explanatory variables that will affect the effect of the regression equation. The results of factor analysis of variance are shown in Table 14.

The equipment regression analysis is shown in Figure 11.

The F value obtained by the analysis of variance is 2.294, and the corresponding significance is 0.916. This value is greater than the 0.05 significance level. Therefore, it is believed that the occupational category has no effect on the consumer satisfaction of wearable device users. The statistics of different positions are shown in Figure 12.

The user's perceived risk is negatively correlated with app service application satisfaction; that is, the higher the perceived risk, the lower the user's service satisfaction and vice versa. From a research perspective, we can understand

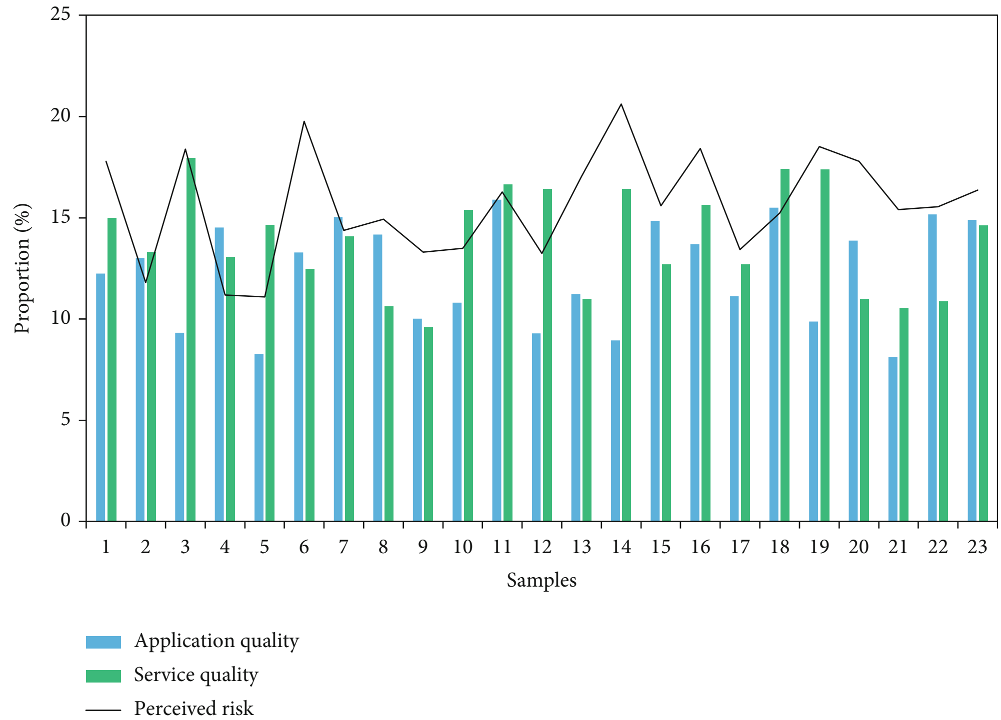

Figure 11: The equipment regression analysis.

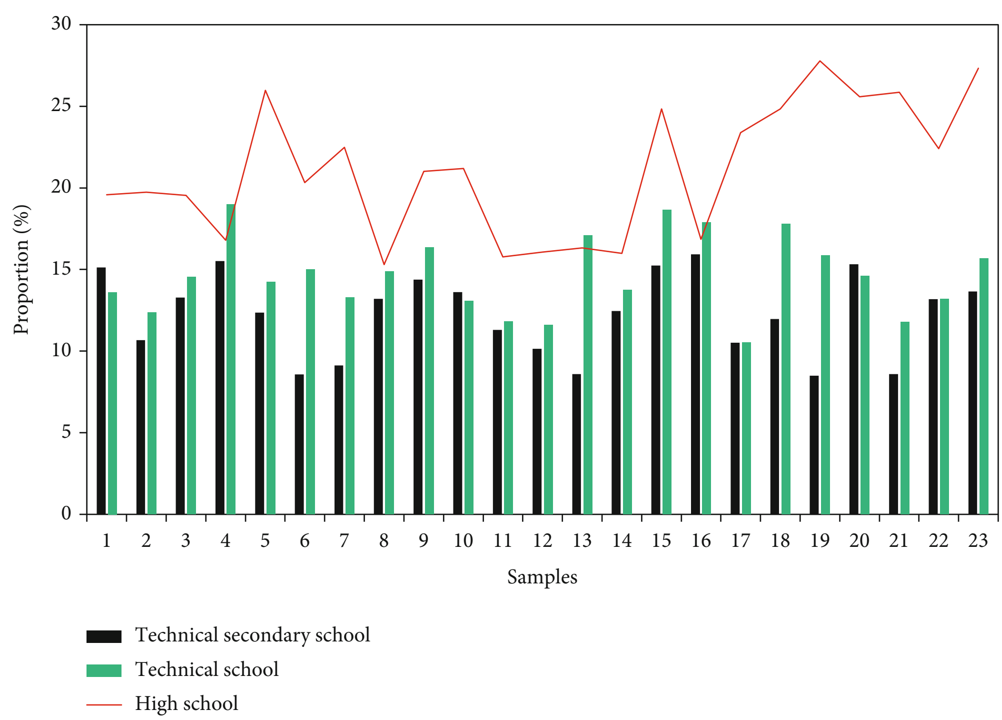

Figure 12: The statistics of different positions.

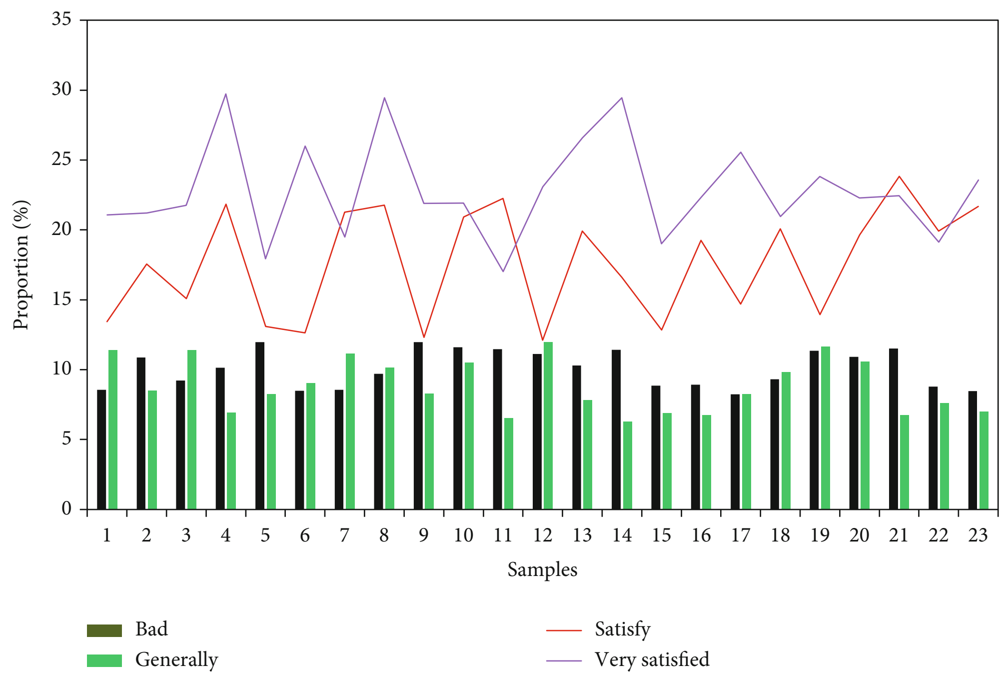

FIGURE 13: The satisfaction evaluation of festival volunteers.

this as the uncertainty of the results will affect user emotions. The satisfaction evaluation of festival volunteers is shown in Figure 13.

5. Conclusions

In the transmission of video data, if the data is lost, the quality of the transmitted image will be reduced if the recovery process is not carried out. Wireless transmission mainly relies on satellite transmission, digital microwave, and 3G and 4G networks that have emerged in recent years. Due to the high channel error rate of wireless transmission, it is easy to cause video data to be lost during channel transmission. Therefore, in wireless network communication, it is necessary to use lost packet recovery technology to realize the recovery of error messages. The patterns of behavior and time and space of festival volunteers' behavior have been the current hotspots, and the relative relationship between short-term and long-term behavior has been neglected. This is to incorporate volunteers into daily activities and to focus on their interaction with the daily behavior. From the two perspectives of rhythm analysis and time geography, the corresponding data is obtained through wearable devices, and clustering analysis and analysis of variance are used to explore the relationship and difference between physiological structure and activity structure in daily life and tourism life state. The main structure of the study is as follows:

(1) According to the wearable device questionnaire, 72.8% of the people use smart wearable devices in the festival. The most interesting feature of wearable devices is health index tracking. The most popular wearable device is mobile app. Its satisfaction is at two extremes, but the overall performance is good. The application of wearable devices as a whole improves the enthusiasm of users to work in volunteering

(2) Volunteer activity directly and indirectly affects the individual's life rhythm by affecting the individual's sleep rhythm

In terms of sleep start, awake time, time to fall asleep, active time per day, mileage, walking consumption, and total walking time, judging from the number of days of volunteer service, their volunteer services are usually concentrated on Fridays and weekends; this is also required by attractions.

(3) The time and space characteristics of festival volunteers on rest days and work days are quite different

The rhythm of life of festival volunteers during their volunteer service is more influenced by the rhythm of society, and the natural rhythm compromises to the social rhythm. Specifically, the festival volunteers went to bed early and got up early during their volunteer service. The duration of activity was shorter, but the mileage and energy consumption were higher than normal. During the voluntary period, the activities are intense, the body consumption is significantly higher than daily life, and the adaptation to the diet and the environment increases the fatigue of the body. Therefore, when the volunteering ends, the human body will have a certain recovery period. During this period, people will try to reduce the chance of going out, and the consciousness will recover quickly. This is the main reason for the excessive spillover of volunteers.

(4) The choice of going out in daily activities after volunteer activity is significantly reduced, and volunteer activity has a spillover effects on daily life

An analysis of the variance of the straight-line distance between the day after continuous volunteering and intermittent volunteering show that the day after continuous volunteering are likely to be the type of not going out of the door, the average walking distance on that day after continuous volunteering is about 0.8 km, and the average distance on the day after intermittent volunteering is about 1.9 km. The F value is 6.14, and the P value is 0.01.

Data Availability

This article does not cover data research. No data were used to support this study.

Conflicts of Interest

The author declares that he has no conflicts of interest.

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