Yang L et al. (2025) HARMONIOUS CONSTRUCTION OF OUTDOOR SPORTS AND ENVIRONMENTAL PROTECTION IN MOUNTAINOUS AREAS UNDER ECOLOGICAL CIVILIZATION BACKGROUND. Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte vol. 25 (99) pp. 215-232
DOI: https://doi.org/10.15366/rimcafd2025.99.015

ORIGINAL

HARMONIOUS CONSTRUCTION OF OUTDOOR SPORTS AND ENVIRONMENTAL PROTECTION IN MOUNTAINOUS AREAS UNDER ECOLOGICAL CIVILIZATION BACKGROUND

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Recibido 13 de Marzo de 2024 **Received** March 13, 2024
Aceptado 17 de Octubre de 2024 **Accepted** October 17, 2024

ABSTRACT

In China, the government has implemented various policies aimed at promoting environmental protection in the context of outdoor sports. However, the reality is more complex. Challenges such as inadequate government oversight, a lack of public awareness regarding environmental issues, and outdated management practices have hindered effective environmental stewardship. These obstacles contribute to a troubling scenario where the enthusiasm for outdoor sports conflicts with the imperative of ecological conservation. To gain deeper insights into this issue, interviews were conducted with outdoor sports enthusiasts and leaders of local clubs. These discussions revealed a growing tension between the increasing popularity of mountain sports and the need to protect natural habitats. As more individuals engage in outdoor activities, the potential for ecological degradation rises, raising significant concerns among advocates for both outdoor recreation and environmental preservation. The evolution of mountain outdoor sports, driven by people's aspirations for a fulfilling lifestyle, has led to this emerging conflict. The author’s research is motivated by a desire to explore these contradictions, seeking pathways that promote responsible outdoor activities while ensuring the protection of our ecological treasures.

KEYWORDS: Ecological Civilization; Mountain Outdoor Sports; Environmental

Protection

1. INTRODUCTION

Amidst the swift economic growth in China, urban industrialization is progressing at a rapid pace. However, the excessive exploitation and utilization of natural resources have placed the ecological environment under significant strain. The world's most populous nation, coupled with its high-speed economic development, exacerbates the pressure on an already delicate ecosystem, posing greater threats to its stability. Environmental issues have become some of the most pressing challenges faced by human society. The roots of environmental degradation are largely attributed to population-driven pressures(Xiao & Zhao, 2017). The escalating demand for materials and consumption, along with the irrational use of resources, have led to the overexploitation of renewable resources beyond their capacity for regeneration. At the same time, the rate of utilization of non-renewable resources is also accelerating, leading to an increased rate of depletion. In the pursuit of economic growth, there is a tendency to sacrifice environmental health for economic gains. Human life and survival are inextricably linked to the natural ecological environment, which serves as the foundation and sustenance for human existence. Mountain ecosystems, being relatively fragile and less frequently interacted with by humans, are particularly susceptible to the impacts of human activities. The chemicals present in modern society often struggle to be effectively absorbed and degraded once they enter these ecosystems, leading to a conflict between mountain-based outdoor activities and environmental conservation. A report, often regarded as a "barometer" of public environmental awareness and behavior in China, was released on January 16, 2007. The data indicated that the public's overall environmental awareness scored 57.05, environmental behavior scored 55.17, and environmental satisfaction scored 60.20 (Gan et al., 2022). This reveals a discrepancy between the public's environmental consciousness and their actions, with two areas scoring below passing grades and one just above, signaling a need for improvement in environmental stewardship(Zhang et al., 2016). Outdoor sports highlight the vulnerability of the natural environment, yet there is a tendency to prioritize human conquest over nature, often neglecting the environmental feedback(Vanpoulle et al., 2017). People increasingly seek outdoor sports as a means to fulfill their need for self-improvement and recreation, embracing the natural world (Wang & Chen, 2020). As globalization and urbanization trends intensify, so does the pace of life and the stress experienced by individuals. Seeking refuge in nature has become a popular leisure activity, allowing people to escape their troubles and connect with the natural world (Pękosławski et al., 2021). The impact of human activities in mountainous regions on the natural environment is substantial, ranging from litter pollution to water source contamination and even the risk of forest fires. The relatively pristine mountain ecosystem, being more fragile, warrants increased attention (Wen et al., 2021).

Regulating and guiding outdoor mountaineers to protect the ecological environment during their activities, preventing ecological damage and pollution, and harmonizing the development of outdoor mountain sports with environmental protection within the framework of ecological civilization are issues that require thoughtful consideration (Wang & Chen, 2020). The influx of people to mountainous areas for cultural entertainment and rest has led to a loss of natural "purity" in these regions, with various forms of pollution following suit. The protection of natural environments in mountainous areas has become an urgent issue (Sun et al., 2016). This paper, set against the backdrop of ecological civilization, analyzes the conflict between mountain outdoor sports and environmental preservation, and proposes strategies to harmonize their relationship. This study holds practical and theoretical significance, with its innovation lying in: The primary focus of this paper is to examine the environmental preservation challenges posed by China's mountain outdoor sports. It conducts a scientific analysis of these issues within the context of ecological civilization construction and offers practical recommendations to address the ecological damage associated with China's mountain outdoor sports, particularly at the institutional level. The aim is to develop feasible systems that foster the harmonious and sustainable development of outdoor mountain sports alongside the ecological environment.

2. Related Work

Chinese sports academia primarily explores the nexus between sports and the environment through the lens of sports geography, focusing on a microscopic perspective. National researchers concentrate on the origins, consequences, and solutions regarding the interplay between sports and environmental conservation. Their investigations into human sports and environmental issues often center on the connection between urban sports activities and the urban environment, with a particular emphasis on theoretical studies concerning environmental degradation resulting from sports development. PAIS S, through an extensive dataset, highlighted the general lack of environmental consciousness among the Chinese populace and, after thorough analysis, concluded that enhancing public environmental awareness is the sole path to sustainable development. The research suggests the following strategies to boost environmental consciousness (Pais et al., 2020). Li et al. detailed the current state of environmental pollution in China, its detrimental effects on the population, and the critical need to raise environmental awareness across the board, proposing several measures to achieve this (Li et al., 2015). Dospatliev and Ivanova, citing air, water, and noise pollution in sports, identified the environmental harm caused by sports development and discussed the imperative of environmental protection from the perspective of the dialectical relationship between sports progression and the ecological environment (Dospatliev & Ivanova, 2021). Nyssen J emphasized that the symbiosis of sports and ecology can be established by

raising environmental awareness, creating environmental protection plans, fostering environmental cooperation in related sectors, and instituting environmental protection oversight mechanisms (Nyssen et al., 2014). Bojko O noted that the influx of mountaineering and associated cultural activities has stripped former pristine mountainous regions of their natural "innocence," leading to a cascade of pollution types (Bojko & Kabala, 2016). Huang pointed out the deficiency of environmental protection concepts among most outdoor enthusiasts and the urgent need for improved national supervision and management systems to mitigate the escalating impact on the natural environment. His discussion primarily revolved around soil, fauna, flora, water environments, and atmospheric conditions in the context of outdoor sports, advocating for constant ecological protection before and after outdoor activities (Huang et al., 2018). Sgroi f espoused the philosophy of green environmental awareness, which advocates for a global and holistic approach and simple, low-carbon, and minimalist methods to reduce consumption, thereby achieving a harmonious balance in the relationship between humans and nature, aligning with the values and behavioral patterns that humans have been pursuing to manage the human-nature relationship appropriately and rationally (Sgroi, 2020). Schichtel B a uses quantitative research methods (hierarchical regression analysis) through empirical testing. The research results show that social capital is a regulatory variable, which positively regulates the relationship between Eco-tourism income and residents' environmental awareness. This research conclusion has important management implications for ecotourism practice (Schichtel et al., 2019). E Mahé believes that the unreasonable development in sports and the environmental problems generated in the process of sports destroy the ecological sustainability, and at the same time, they also affect and restrict the development of sports. On the issue of environmental pollution, only sports and environmental protection can achieve the sustainable development of sports (Mahé et al., 2011). Hishe h elaborated the interest relationship between sports and environmental protection. Through the introduction of the environmental protection concepts and measures of the Lixiang Olympic Games, the development and progress of environmental protection in sports are explained, and it is pointed out that the trend of the Olympic Games towards environmental protection and the realization of green cities, sports and environment is the trend of sports development in the future (Hishe et al., 2021).

3. Methodology

3.1 Overview of Mountain Outdoor Sports and Environmental Protection

In the 1970s and 1980s, amidst a backdrop of escalating global environmental challenges and societal issues stemming from energy crises, the global community engaged in a widespread debate on the concept of "limits to growth." The term "ecological civilization" has been interpreted variously by

scholars, with the definitions generally categorized as: (1) A broad interpretation of ecological civilization. (2) A narrow interpretation of ecological civilization. (3) Ecological civilization as a developmental paradigm. (4) Ecological civilization with an institutional framework. In China, mountaineering organizations encompass a range of entities including the China Mountaineering Association, outdoor clubs, travel agencies, educational institutions (such as school teams and student societies), private volunteer groups, and other affiliated organizations. These organizations are pivotal in the development and implementation of the national competition framework for outdoor sports, which includes establishing plans, rules, and regulations, as well as managing national competitions and organizing key events. They are also tasked with the unified management of mountain climbing activities that are open to international participation. Their responsibilities extend to spearheading scientific and technological research in mountaineering, developing equipment, enhancing scientific training methods, and coordinating publicity and publications. These organizations play a crucial role in conducting extensive technical training for mountaineering and outdoor sports, thereby nurturing talent to support the growth of these activities. Furthermore, they are committed to preserving and promoting the spirit of mountaineering, disseminating mountaineering culture, and increasing the popularity of mountaineering and outdoor sports among the youth. Regardless of their commercial status, these organizations provide an excellent platform for individuals engaging in outdoor mountain sports. The rise of these outdoor mountain sports organizations reflects the contemporary need for people to seek refuge from urban environments and reconnect with nature. These organizations have adeptly addressed the needs of the populace, catering to various forms of travel, whether it be budget-friendly "poor travel" or leisurely "corrupt travel" focused on relaxation and enjoyment. When people are engaged in outdoor sports from the busy city life, people's body and mind are relatively relaxed and enjoy the beautiful natural environment. At the same time, their self-restraint ability is relatively reduced, and their environmental awareness is relatively weak. In the process of outdoor sports, most outdoor athletes have poor personal hygiene habits, which are easy to damage the outdoor environment. Although efforts have been made to improve the outdoor environment, they have not developed a good outdoor hygiene habit. It is common for most outdoor sports participants to dispose of garbage at will, which may cause more environmental pollution and damage, but does not cause improvement in behavior, which is worrying. The so-called awareness of environmental protection means that people's awareness of the environment, environmental protection experience and environmental protection behavior tendency formed through a series of psychological activities can be divided into three stages: weak, medium and strong, which are affected by personal knowledge and experience, living environment, education level and major events. With the awareness of environmental protection, it is possible to produce environmental protection

behaviors. As far as outdoor sports are concerned, when the members of the club make it clear that they should cherish animals and plants, ensure that water sources are not polluted, and put an end to the use of disposable goods in outdoor sports, they will have a sense of environmental protection. In the process of outdoor sports of club members, under the action of the above-mentioned awareness of environmental protection, they bypass the breeding grounds of wild animals, go to the toilet and stay away from the water source, and collect the generated domestic garbage immediately, even if the garbage is not generated by himself, and so on, which will lead to environmental protection behavior.

3.2 Improvement and Innovation of Personalized Recommendation System for Outdoor Sports

Recommending users' preferred content to users is system, which consists of several modules: recommendation algorithm modeling, collecting user-related information data, analyzing and processing user information, user modeling, collecting information related to recommended content, processing recommended object information, recommending object modeling, outputting recommended results, evaluating recommended results and recommending feedback. As shown in Figure 1.

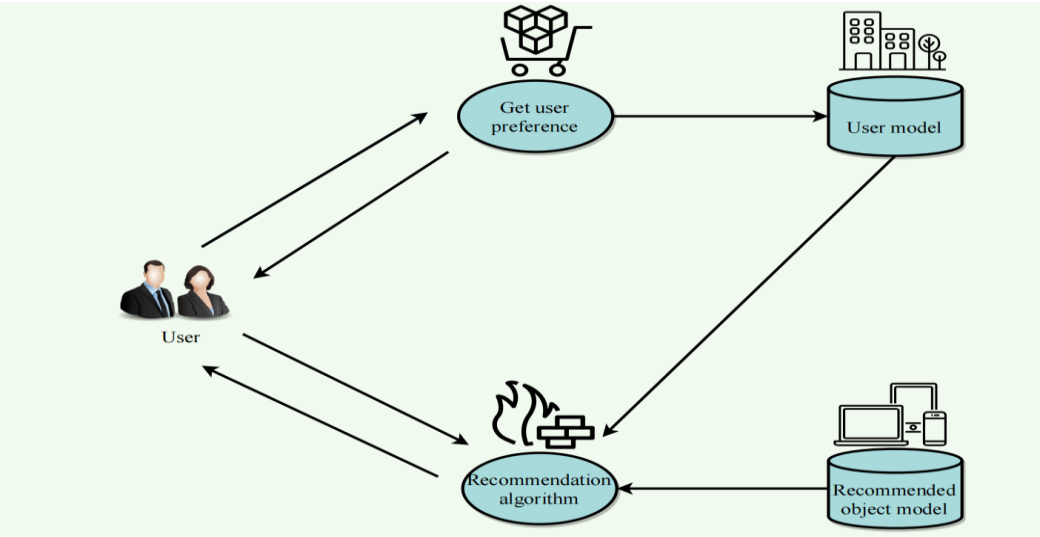

Figure 1: Recommended system model

The priority of network topology control is network connectivity, which is the most basic requirement of communication network, that is, any node in the network structure can communicate. There are two main methods to study network connectivity; The methods of probability statistics and graph theory. Among them, graph theory methods include minimum spanning tree algorithm, correlation adjacency graph algorithm, H-keratinization algorithm, etc. The methods based on probability statistics include the research of node number, node distribution and the relationship between node communication range and

network connectivity probability. When a node in the network fails or moves, and the corresponding link breaks, a robust extension with good error-checking ability should still be able to make the network communicate normally. However, these properties are often contradictory to each other. For example, for the sake of strong connectivity and robustness, nodes should increase transmission power, but this violates the requirement of network topology sparsity, reduces the network swallowing rate, and also increases the number of nodes. Therefore, in many cases, topology control should make a good balance between many properties of smart flapping structure according to the actual situation. These are the characteristics of the impact of mountain outdoor sports on the ecological environment, and it is precisely because of these characteristics that the impact on the ecological environment is long-term, profound and difficult to recover. These characteristics are enough to show that the impact of mountain outdoor sports on the ecological environment should be paid enough attention and standardized. As shown in Figure 2.

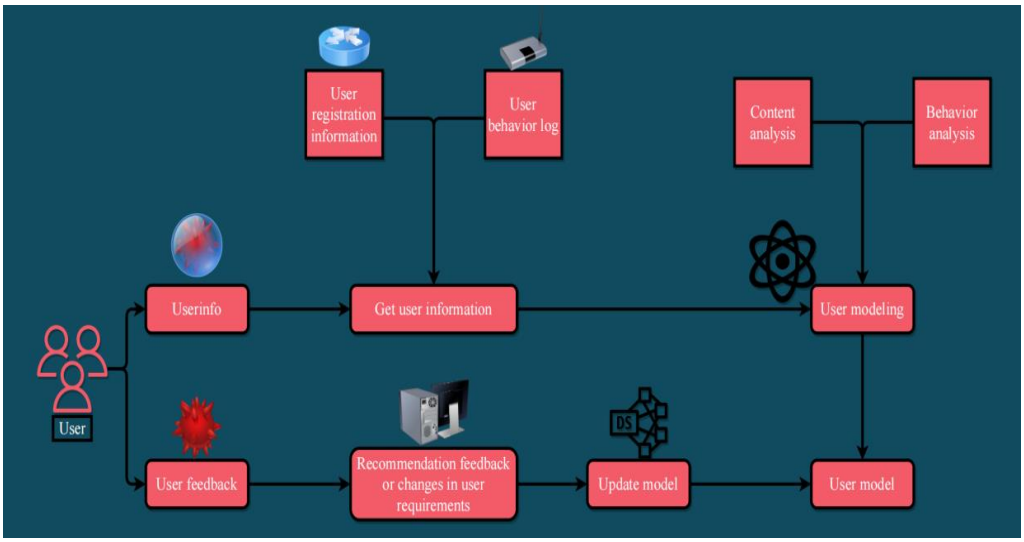

Figure 2: User modeling process

The way to display and obtain information is highly dependent on the user, and the authenticity of the submitted information has a great relationship with the degree of cooperation of the user. Objectively speaking, the current system of laws and regulations on environmental legislation and sports legislation has indeed played a positive role in promoting the development and prosperity of China's environmental protection and sports undertakings in a certain period of time. However, "due to the limitations of legislation and the backward level of economic development at that time, the two aspects of legislation could not be effectively connected, and the relevant system design could not meet the practical requirements of mountain outdoor sports for ecological preservation of environment". User feature vectors are generally represented by multiple keywords, and the formula is as follows:

$$\vec{U_u} = \{K(k1_u, k2_u, k3_u, \bullet\bullet\bullet, kn_u), W(w1_u, w2_u, w3_u, \bullet\bullet\bullet, wn_u)\} \quad (1)$$

Or

$$\vec{U_u} = \{(k1_u, w1_u), (k2_u, w2_u), (k3_u, w3_u), \bullet\bullet\bullet, (kn_u, wn_u)\} \quad (2)$$

The development concept represents a comprehensive and foundational perspective that individuals hold regarding the essence, objectives, scope, and criteria of development within the developmental process. It encompasses a broad and systematic understanding of development, including what needs to be developed and the approaches to be taken. The type of development concept adopted significantly shapes the developmental trajectory, model, and strategic framework, exerting a profound and overarching influence on developmental practices. In essence, the notion of sustainable tourism development can be encapsulated as follows: "Development in the tourism sector should take into account the dynamic relationship between tourism and natural resources, societal culture, and the ecological environment. It must proceed within the limits of environmental sustainability, striving for a balanced advancement that encompasses tourism, resource management, and the human habitat, with a view to safeguarding the interests of future generations." The sustainability of outdoor sports represents an extension and practical application of sustainable development principles within the sports domain. At the heart of sustainable development is the synergistic evolution of the complex "nature-society-economy" system.

3.3 Collaborative Filtering Recommendation Algorithm

For our country's mountain outdoor sports, it was officially recognized by the national sports authorities in, and the State Sports General Administration listed mountain outdoor sports as an officially launched sports event, and issued relevant guiding opinions. This indicates that China's mountain outdoor sports have gone from spontaneous and budding stage to a new stage of standardized development, and indicates that the mountain outdoor sports project has also ushered in a new opportunity of leaping development. It can be said that the emergence of outdoor sports is a spontaneous response of sports to meet the material and spiritual needs of mankind, and is also an inevitable choice to conform to the trend of the times in the process of comprehensive development of sports. (1) Jacques's coefficient

$$sim(u, v) = \frac{|N(u) \cap N(v)|}{|N(u) \cup N(v)|} \quad (3)$$

Or

$$sim(u,v) = \frac{|N(u) \cap N(v)|}{\sqrt{|N(u)||N(v)|}} \tag{4}$$

(2) Cosine similarity

$$sim(u,v) = cos(\vec{u},\vec{v}) = \frac{\vec{u} \times \vec{v}}{\|\vec{u}\| \times \|\vec{v}\|} \tag{5}$$

Where: $\vec{u}$ and $\vec{v}$ are the scoring vectors of users u and u.

(3) Correlation similarity

$$sim(n,v) = \frac{\sum_{c \in I_{uv}} (R_{uc} - \overline{R_u})(R_{vc} - \overline{R_v})}{\sqrt{\sum_{c \in I_{uv}} (R_{uc} - \overline{R_u})^2 \sum_{c \in I_{uv}} (R_{vc} - \overline{R_v})^2}} \tag{6}$$

(4) Modified cosine similarity

$$sim(n,v) = \frac{\sum_{c \in I_{uv}} (R_{uc} - \overline{R_u})(R_{vc} - \overline{R_v})}{\sqrt{\sum_{c \in I_{uv}} (R_{uc} - \overline{R_u})^2 \sum_{c \in I_{uv}} (R_{vc} - \overline{R_v})^2}} \tag{7}$$

Through step 2, you can get the similar user set or the nearest neighbor set of the target user. If the set is represented by SN_u, the user's rating on the set is, and the calculation method is as follows:

$$P_{ui} = \overline{R_u} + \frac{\sum_{n \in SN_u} sim(u,n) \cdot (R_{ni} - \overline{R_n})}{\sum_{n \in SN_u} |sim(u,n)|} \tag{8}$$

Topology control technology of information network has great influence on network performance, because the wireless transmission power of transmitted signals can be adjusted according to the scale and type of current network topology through power control, so that nodes can not only meet the communication requirements, but also avoid the rapid energy consumption of system components due to excessive transmission power, thus saving energy and enhancing the life cycle of the network. In addition, there are some special nodes, such as sensor nodes, which need to be powered by batteries when working. Once the energy is exhausted, the nodes will fail. Therefore, how to design an efficient and reasonable network topology, control the use of network energy, improve the utilization rate of network energy, and prolong the network life cycle to the greatest extent, has become one of the key research issues of network topology control. The "shortest" path between any pair of nodes is

reserved in the network to minimize the power required for the packet to pass through the path, which is also called the minimum energy characteristic. The reservation of the shortest path can reduce the routing overhead and transmission delay, which is particularly important for networks with large delay and high link error rate. Each node should collect its own local information, which can reduce the cost of information interaction, improve the convergence speed of the algorithm, and ensure the quality of service of the network. Therefore, it is also an important goal of topology control algorithm to effectively reduce the interference of the network, improve the efficiency of network link reuse, and ensure the quality of service of the network. In networks that handle spatial information, the assignment of link weights is a critical process that involves assessing the upper layer service requirements for bandwidth, latency, latency variation, and reliability. This analysis is complemented by considering the actual contribution of each link to these performance metrics. The weight assigned to each link serves as a critical input for the subsequent topology control algorithm, which utilizes these weights to make decisions on link and node selections. The links that are incorporated into the resulting network expansion are detailed in Table 1.

Table 1: Generating links

STARTING POINT END POINT	WEIGHT	STARTING POINT END POINT	WEIGHT
(1,2)	7	(1,2)	10
(2,3)	8	(2,3)	8
(3,4)	7	(3,4)	2
(4,5)	9	(4,5)	8
(5,6)	12	(5,6)	18

Hence, the Mountaineering Management Center under the State Sports General Administration, being the supreme authority for mountain outdoor sports, bears the responsibility of crafting industry standards for such activities in China. It is imperative for this body to formulate and disseminate pertinent normative documents and guiding principles in a timely manner. These actions are essential to actively direct and foster the sustainable growth of mountain outdoor sports. Concurrently, there is an urgent need to establish a quality supervision system for outdoor sports equipment utilized in mountainous regions. Mountain outdoor activities, given their specialized nature, pose significant challenges and inherent risks, necessitating stringent standards for sports equipment and gear.

The stakes are high, as minor equipment failures can jeopardize user safety. It is crucial to ensure the qualification of equipment manufacturers and to implement rigorous quality supervision for mountain outdoor sports equipment available in the market. Publicizing and notifying relevant information on official portals will contribute to the standardization and safety of

outdoor sports equipment. This proactive approach will effectively mitigate the occurrence of outdoor sports accidents or risks that may arise due to equipment-related factors.

4. Result Analysis and Discussion

Integrating a personalized recommendation feature into an existing outdoor sports platform can significantly enhance user experience. Industry veterans with extensive outdoor sports experience can be appointed as system administrators for the platform. These administrators, who typically possess outdoor sports training certification, are capable of doubling as coaches, leveraging their in-depth knowledge of outdoor sports to guide and train users. Among the various network simulation tools available, the NS2 network simulation tool is particularly popular. NS2 employs a series of object-oriented design approaches and offers a vast array of simulation modules. This allows for comprehensive simulation and analysis of widely utilized network protocols and algorithms, providing highly intuitive insights into system performance. The NS series has evolved from its original version to the more advanced NS2, and the latest iteration, NS3, has gained global recognition. However, NS3 currently lacks certain functionalities in wireless network simulation, and its user base is significantly different from that of NS2. Therefore, this study opts to focus on NS2. With the aim of examining the impact of topology control algorithms on network performance, this paper conducts simulation analyses of key performance metrics. For instance, it assesses the network's reliability, which is a performance indicator based on the network's ability to transmit and process data, especially under conditions of increased network load or a growing number of nodes. The performance metrics analyzed in this paper include packet delivery rate, control overhead, delay, and throughput. The specific parameter settings used in the simulations are presented in Table 2.

Table 2: Simulation parameters

SIMULATION PARAMETERS	VALUE AND TYPE
NUMBER OF NODES/NUMBER	30
TRANSMISSION DATA TYPE	CBR
ROUTING PROTOCOL	AODV
PAYLOAD/(BYTES)	512
NUMBER OF DATA STREAMS/NUMBER	802.11
MAC LAYER PROTOCOL	TwoRAYGround
WIRELESS COMMUNICATION MODEL	30
ANTENNA MODE	OmniAntenna

The network includes both random failure nodes and regional failure nodes. With the increase of the number of node failures, 2-4 random failure nodes are randomly generated in the network simulation, and other failure

nodes are all regional failure nodes. The original topology, the K (= 2) fault-tolerant topology control algorithm and the convex region fault-tolerant topology control algorithm are respectively simulated and analyzed. The topology structure is shown in Figure 3.

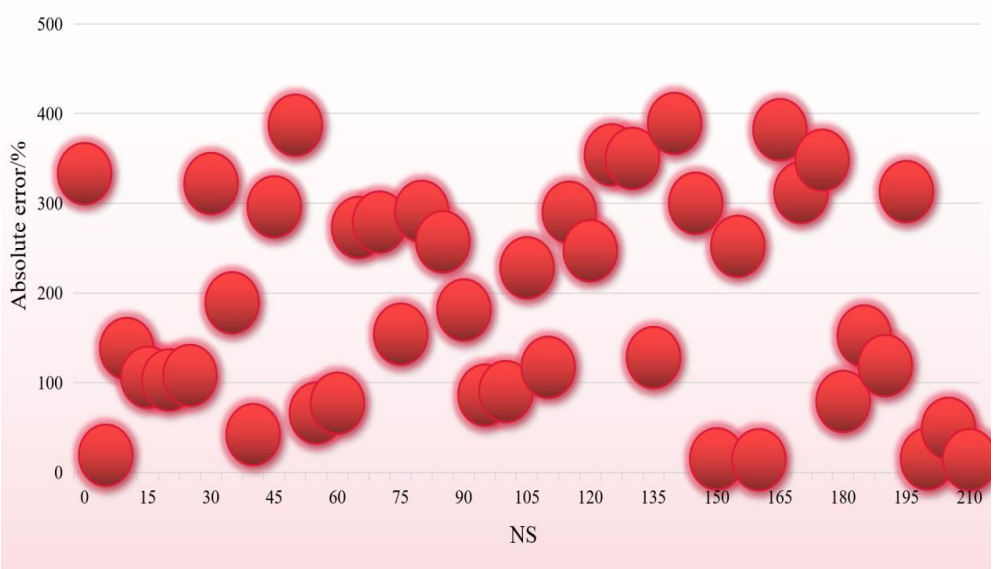

Figure 3: Simulation topology under NS

Figure 4 Shows how the packet delivery rate of the original graph, K-fault-tolerant topology and convex region fault-tolerant topology changes with the packet delivery rate. As can be seen from Figure 4, when the packet transmission rate of nodes is slow, the successful packet delivery rate of the three algorithms is high. This is because when the packet transmission rate is low, the load in the network is small, which will not cause too much burden on the key points used for data forwarding in the topology, and therefore, the bottleneck will not be formed at the key nodes to cause congestion.

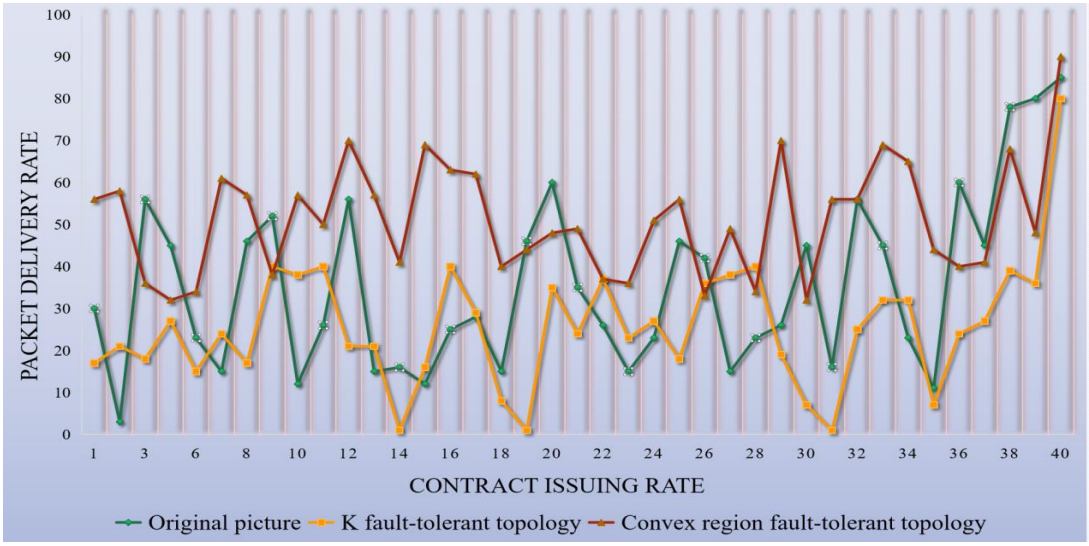

Figure 4: Comparison of packet delivery rate when network load increases

With the increase of network load, compared with the first two algorithms, the successful packet delivery rate of the convex region fault-tolerant algorithm network changes more slowly, and the packet success rate of the two algorithms decreases more. This is because with the gradual increase of network load, the data forwarding volume of key points in the topology surges, resulting in a large amount of information congestion at key nodes, and a large number of packet data packets cannot successfully reach the destination node, Resulting in a rapid reduction in the delivery rate. The network topology generated by the smart area fault-tolerant topology control algorithm can gradually make the network traffic tend to be balanced, provide a good foundation for route optimization and load balance distribution, improve communication efficiency and optimize network performance. The convex region fault-tolerant topology control algorithm optimizes the network structure. With the increase of network load, information congestion will not be formed at the key nodes, and a large number of packets for routing should not be sent, so the network overhead curve tends to decrease. As shown in Figure 5.

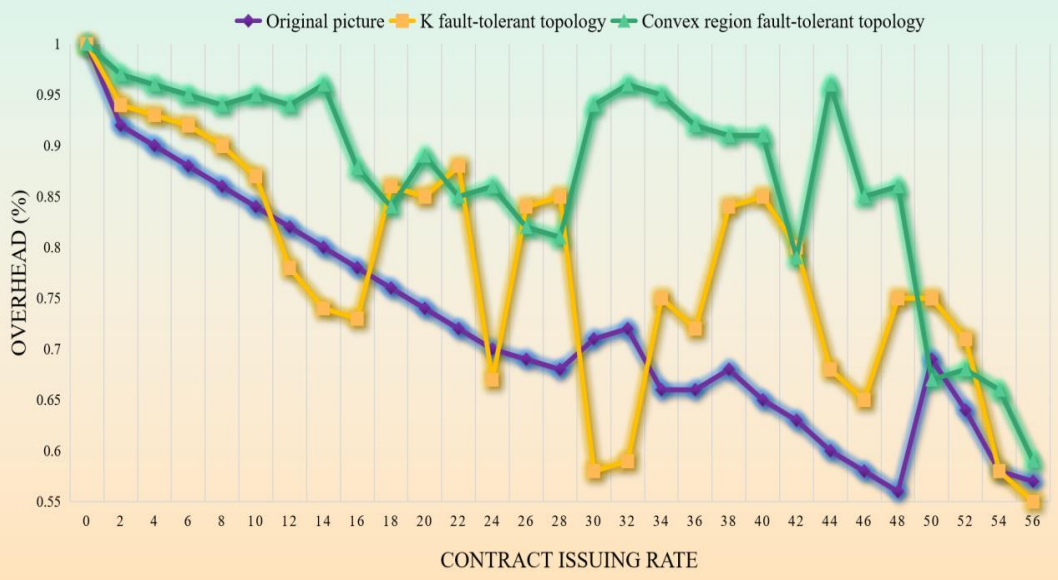

Figure 5: Comparison of control overhead when network load increases

Figure 6 depicts the change of network throughput with the increase of node failures. When the number of failures in the network is small, the network throughput of the three algorithms is high. This is because there are a lot of redundant link resources in the topology of the network. Even if a few nodes fail, the impact on the successful sending and receiving of data packets is small, which makes the success probability of data packets high and the packet loss is small. With the increase of the number of network failures, the network throughput of original graph topology and K-connected topology drops sharply, while the network throughput of convex area fault-tolerant topology control algorithm changes little. However, the network structure generated by the convex area fault-tolerant topology control algorithm is reasonable and sparse.

Therefore, with the increase of the number of network node failures, a large number of control messages for routing will not be generated, and the phenomenon of message conflicts and congestion will not be caused. The bandwidth utilization is balanced, which has little impact on throughput.

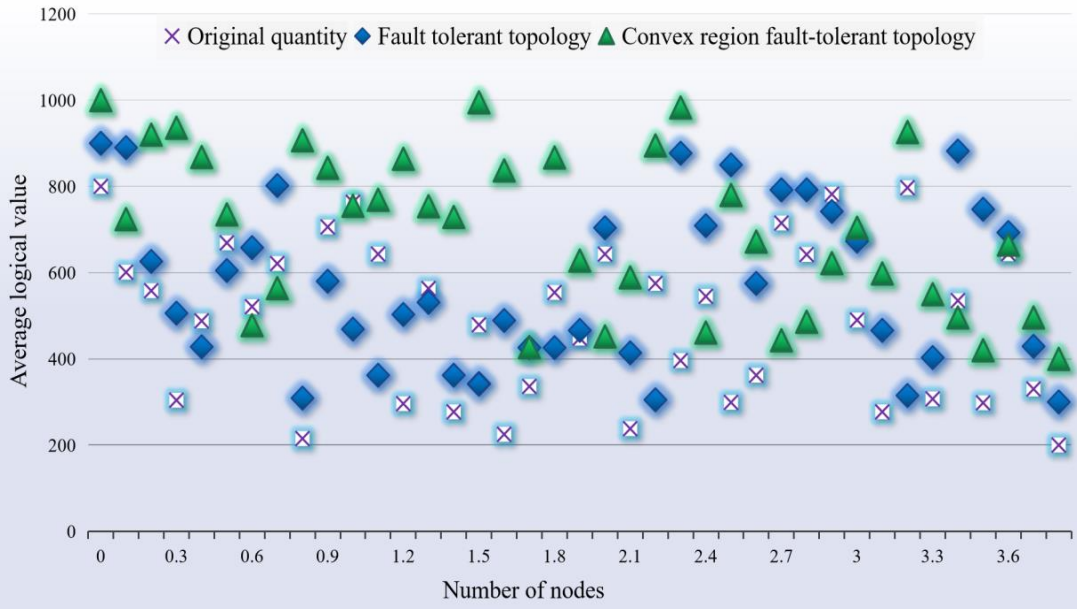

Figure 6: Comparison of the average logical value when the network scale increases

Network scalability refers to that with the continuous expansion of the network scale, the network can maintain the normal operation of services, have data transmission performance and data processing ability. Network scalability reflects the availability of algorithms in large-scale network environment. In this paper, the average logic value, overhead, delay and network throughput are simulated and analyzed. As the number of nodes increases, the network throughput for the initial two algorithms experiences a significant decline, whereas the network throughput for the convex area fault-tolerant control algorithm remains relatively stable. This disparity arises because, with a growing number of nodes, certain key points within the network topology become chokepoints for data transmission tasks. A substantial volume of data is routed through these pivotal nodes, resulting in severe network congestion. Consequently, a considerable number of data packets fail to reach their intended destinations, compelling the network to initiate route retransmissions. This rerouting process generates additional control messages, such as path discovery requests and responses, which consume valuable bandwidth resources and significantly impair the network's bandwidth utilization, leading to a drop in network throughput. However, when employing the convex area fault-tolerant topology control algorithm, the network topology is less dense. Even with an increase in the number of nodes, data transmission does not become congested, and the majority of data packets are able to successfully reach their destination nodes. This allows the network throughput to be

sustained at a certain level, remaining essentially unchanged. For a visual representation of this phenomenon, refer to Figure 7.

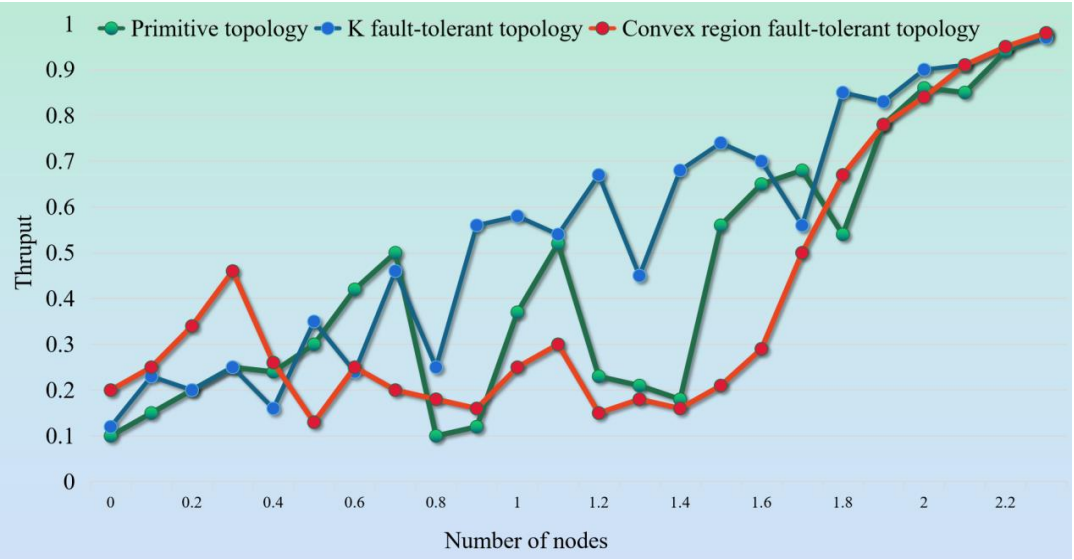

Figure 7: Comparison of network throughput when network scale increases

Furthermore, by conducting income analysis and considering issues of fairness, we can better manage the financial costs associated with mountain outdoor sports and the expenses required for controlling ecological losses. Regulating and managing the tax and fee mechanisms to achieve economic balance can more effectively mediate and foster the relationship between the development of mountain outdoor sports and the protection of the ecological environment. To this end, it is essential to refine the management mechanisms to advance the growth of mountain outdoor sports. This includes conducting environmental assessments of the development and implementation of mountain outdoor sports across various regions and locations, evaluating their ecological impact, and employing economic measures to compensate for ecological effects. Charging individuals or groups for participating in mountain outdoor sports is one such economic approach. This taxation can significantly offset ecological impacts, preventing the unrestricted development of these sports from causing irreversible environmental damage and ensuring ecological protection through stricter economic policies. When conflicts arise between mountain outdoor sports and the ecological environment, it is necessary to use the economic incentives provided by environmental law for coordination and regulation. Additionally, it is crucial to address a range of related issues, such as:

- Promoting Environmental Fairness: Ensuring that the principle of environmental fairness is upheld, which includes guaranteeing equitable access to basic environmental rights for all members of society.

- Improving Environmental Information Disclosure: Enhancing

systems that make environmental information transparent and accessible to the public, which is vital for informed decision-making and public accountability.

- Enhancing Public Participation: Strengthening mechanisms that allow for public involvement in environmental decisions, ensuring that community voices are heard and considered in environmental governance.

- Ensuring Procedural Fairness in Environmental Litigation: Shaping a legal framework where environmental public interest litigation is conducted fairly, providing a platform for addressing environmental injustices.

By addressing these issues, we can cultivate a fair ecological culture that values both the enjoyment of outdoor sports and the preservation of the natural environment. This balanced approach will contribute to sustainable development that respects ecological limits and enhances the quality of life for current and future generations.

5. Conclusions

Currently, outdoor sports have grown to be a prevalent method for the public to engage in leisure activities and sports tourism, enjoying widespread popularity. However, during the initial stages of their development in China, outdoor sports enhanced the quality of life for individuals but also had certain detrimental effects on the natural environment. Against the backdrop of ecological civilization, this paper explores the tensions and conflicts between mountain outdoor sports and the preservation of the ecological environment. It elaborates on the paradox between the development of tourism resources and ecological preservation from three perspectives: the dialectical unity between humans and nature, the interplay between tourism resource development and ecological conservation, and the practical dilemmas faced in balancing these two aspects. The paper also delves into the causes of conflicts between mountain outdoor sports and ecological preservation. In the context of system recommendations, when the system is operational, a hybrid recommendation model that incorporates User-Based Collaborative Filtering (UB-CF), Item-Based Collaborative Filtering (IB-CF), and Content-Based Filtering (CBF) is utilized. This integrated approach aims to leverage the strengths of each recommendation strategy to provide more accurate and personalized suggestions to users, enhancing their outdoor sports experiences while also promoting ecologically conscious practices.

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