Research Article

Simulation Design of Intelligent Garden Based on Climate Adaptability and Nonlinear Random Matrix

Yao Lu,1,2 Bingyan Chen,3 Yicheng Xin,4 and Xiaofei Zhu5

1Art Design College, Henan University of Urban Construction, Pingdingshan, Henan 467000, China
2School of Landscape Architecture, Dong-a University, Busan 612-022, Republic of Korea
3School of Design and Art, Henan University of Technology, Zhengzhou, Henan 450000, China
4School of Architecture and Urban Planning, Beijing University of Civil Engineering and Architecture, Zhengzhou, Henan 450000, China
5School of Architecture and Urban Planning, Henan University of Urban Construction, Pingdingshan, Henan 467000, China

Correspondence should be addressed to Bingyan Chen; artcby@haut.edu.cn

Received 8 July 2022; Revised 2 August 2022; Accepted 10 August 2022; Published 29 August 2022

Academic Editor: Ning Cao

Compared with the modern intelligent landscape design, traditional landscape design is often limited to landscape level architectural design and traditional functional design, thus ignoring the advantages of ecological factors and scientific and technological factors embodied in intelligent landscape design. Therefore, the traditional landscape design often has some disadvantages, such as waste of design resources, serious design energy consumption, poor adaptability of design products, weak practicality, and fragile ecological structure. Based on this, this paper will fully consider the role of climate factors such as solar radiation, temperature, wind conditions, and relative temperature and humidity and air pollutants in landscape design. At the same time, various design factors in landscape design will be quantified and statistically analyzed by using the principle of nonlinear random matrix, so as to further optimize the index distribution of balanced design factors and optimize the landscape design scheme. In the actual principle design, this paper adopts the logic idea of digital garden design, based on the design process of garden logic design, garden design foundation preparation, garden design environment analysis, and digital garden design results display, and establishes a parametric digital garden forest model, so as to realize the digital design and simulation of intelligent garden. In the corresponding practical simulation part, this paper carried out an example verification based on the interior and exterior landscape design of a company and realized the establishment of the parametric analysis model of the case based on parametric and visual-related programmable software, thus completing the simulation design of functional components such as garden road layout optimization design, garden greening planting design, garden landscape visual creation effect design, and garden numerical service design; the experimental results show that compared with the traditional garden design, the garden designed in this paper has increased the degree of garden intelligence by about 30%, reduced the energy consumption by about 20% in the corresponding degree of energy conservation and environmental protection, and increased the degree of garden comfort by about 30%.

1. Introduction

Landscape architecture design should be based on climate characteristics, geographical characteristics, and human landscape design. It is not a single stack of landscape architecture limited to vision. With the rapid iterative development of information technology, virtual reality technology, artificial intelligence technology, and other related technologies, more intelligent design elements and digital design elements are involved in landscape design, but the climate adaptive factors of landscape design are increasingly ignored by the designers [1–3]. The corresponding climate adaptive factors in landscape design include solar radiation, climate temperature and humidity, wind, relative temperature and humidity, air pollutants, and other climate factors. A large number of landscape designs completely ignore the importance of this part of
climate factors to landscape design, so that the designed landscape does not adapt to the ecological environment and the corresponding climate characteristics. Therefore, most of the landscape design schemes have become typical designs with waste of resources and poor self-adaptive ability [4–6]. Relevant investigation documents further show that fully considering the climate adaptive factors in landscape architecture design can better create a comfortable human environment, follow the design concept of “people-oriented” in landscape architecture design, further reduce the energy consumption brought by landscape architecture design, save corresponding design funds, improve the health index of residents, and finally promote the sustainable and healthy development of the city [7–9]. The ecological, digital, and intelligent design of urban landscape can effectively reduce the probability of ecological imbalance, urban flood, heat island effect and other problems in the city or local areas, and realize the establishment of sponge effect in the city or local areas, so as to save resources, reduce energy consumption, improve the climate characteristics of the city or local areas, and realize the green, healthy, and sustainable development of the city [10, 11].

In view of the problems existing in the traditional landscape design, such as extremely backward design tools, serious homogenization of landscape design, blocked development of landscape design-related disciplines, lack of digital software talents in landscape design, and landscape design paying attention to artistry and ignoring scientificity, digital landscape design came into being [12–14]. The current digital landscape design technology mainly includes the digital analysis technology of landscape, digital-aided design technology of landscape, digital parametric modeling design of landscape, digital media design technology of landscape, and visualization technology of landscape. With the further integration and cross development of digital technology and landscape design, a large number of them have been applied to the functional parts of landscape greening management, internal intelligent landscape display, virtual reality landscape display and immersive experience [15–17]. Through in-depth analysis of the current traditional digital landscape design ideas, we can find that the current corresponding digital design framework is relatively simple, the corresponding digital design theory is not perfect, and it also lacks systematic theoretical guidance. At the same time, the corresponding modern landscape design often pays too much attention to the application of intelligent and scientific means, and ignores the impact of climate factors on the landscape design in traditional factors. Traditional climate factors include the consideration of natural factors such as wind speed, heat, and radiation. And from these natural factors, the garden design is reasonably arranged, so as to maximize the advantages of intelligent garden design and combine nature with science and technology. The corresponding digital landscape design technicians are also extremely lacking, and the talent support is insufficient. At the same time, a large number of digital landscape designs today lack the consideration of regional climate adaptive factors; it desalinates the ecological problems of landscape architecture design, resulting in a large number of wastes of landscape architecture design resources. Accordingly, the design has no green development value beyond the stacking of landscape vision. Therefore, in the digital design era, fully integrating the climate adaptation factors of landscape design with software technology can further promote the high-quality, sustainable and healthy development of landscape design [18, 19].

Based on the above analysis, the traditional landscape architecture design no longer meets the requirements of green and sustainable development of landscape design. Based on this, this paper will analyze the climate adaptive factors and the integration of nonlinear random matrix and intelligent landscape design technology, and conduct simulation verification analysis based on the corresponding analysis and discussion combined with the actual design cases. Firstly, in terms of climate adaptive factors, this paper will fully consider the role of climate factors such as solar radiation, temperature, wind conditions, relative temperature and humidity and air pollutants in landscape design. At the same time, various design factors in landscape design will be quantified and statistically analyzed by using the principle of nonlinear random matrix, so as to further optimize the index distribution of balanced design factors, so as to optimize the landscape design. In the actual principle design, this paper adopts the logic idea of digital garden design, based on the design process of garden logic design, garden design foundation preparation, garden design environment analysis, digital garden design results display, and establishes a parametric digital garden forest model, so as to realize the digital design and simulation of intelligent garden. In the corresponding practical simulation part, this paper carried out an example verification based on the interior and exterior landscape design of a company, and realized the establishment of the parametric analysis model of the case based on parametric and visual-related programmable software, thus completing the simulation design of functional components such as garden road layout optimization design, garden greening planting design, garden landscape visual creation effect design, and garden numerical service design. The experimental results show that the intelligent landscape design based on climate adaptability and nonlinear matrix has advantages over the traditional design scheme at all levels, and it has certain popularization and practical significance.

Based on the above related analysis and research, the main structure of this paper is arranged as follows: the second section mainly analyzes the current research status in landscape architecture design. The third section of the article will mainly analyze and study the analysis of intelligent landscape design based on climate adaptive factors and nonlinear random matrix. It will mainly analyze and study the climate adaptive factors and nonlinear random matrix analysis algorithm in landscape architecture design, and give the landscape architecture design ideas based on climate adaptive factors and nonlinear random matrix. The fourth section of the article will verify the superiority of the digital design scheme proposed in this paper for the exterior landscape design of a company, and analyze and discuss the
results. Finally, this paper will summarize and explain the future research direction.

2. Related Research: Analysis on the Research Status of Intelligent Landscape Design Technology

The intelligent design of landscape architecture refers to its corresponding digital design. There are many researches on digital design, mainly focusing on the digital analysis, digital-aided design, and digital parameter design of landscape architecture [20, 21]. Firstly, at the level of theoretical research on digital landscape architecture design, relevant European researchers [22, 23] believe that digital landscape architecture design should be multi-compliant and from top to bottom. They believe that digital landscape architecture design should keep pace with the pace of urban development. Relevant Chinese Mainland scholars [23] believe that digital landscape design should follow the coordinated development of ecology and form, the satisfaction of human needs and the innovation of design methods, and emphasize that digital landscape design should be introduced from qualitative design to quantitative design. At the corresponding application level of digital landscape design technology, the United States and other countries [24] first applied BIM Technology and GIS technology to the digital design of landscape architecture. By applying virtual reality technology and digital media technology to landscape design and urban planning, they further beautified the landscape design and improved the intelligence of landscape design. Relevant mainland scholars [25] analyzed the relevant technologies of digital landscape architecture from the aspects of acquisition, storage and sharing of relevant data by constructing the overall digital framework of landscape architecture, and expounded the advantages of digital landscape architecture system from the aspects of monitoring system, security system, and data management system. Relevant European and American industrial companies [26, 27] decomposed the digital design of landscape architecture, and concluded that the digital landscape design mainly includes several important modules, such as generalized intelligent sensor network technology, landscape data transmission, landscape spatial data processing and analysis, landscape spatial data management, landscape spatial data mining and analysis, and believed that the information technology, Internet of things technology, grid computing artificial intelligence technology, and pattern recognition technology can complete the whole process of digital design of landscape architecture. In the specific application of digital design technology of landscape architecture, relevant scholars [28] used BIM Technology to apply BIM Technology to the planning, design, analysis, and evaluation of digital design, so as to improve the design efficiency, deepen the designer’s understanding of landscape design, and improve the design quality. Some scholars [29] directly applied GIS technology to the digital design of gardens, and obtained the maintenance and management of landscape greening in real time through this technology. Based on this, they established a comprehensive information management and detection system for gardens, and realized the intelligent development and management of gardens. Based on the above analysis, the current digital landscape design still lacks systematic design theory, and the corresponding design lacks consideration of regional climate adaptive factors, so it is not scientific and sustainable.

3. Analysis of Intelligent Landscape Design Based on Climate Adaptive Factors and Nonlinear Random Matrix

This section mainly analyzes and explores the intelligent landscape design based on climate adaptive factors and nonlinear random matrix. The core contents and algorithms mainly include the analysis and processing of climate adaptive nonlinear random matrix, the establishment of digital parametric model of intelligent landscape, and the intelligent landscape design of the system. The corresponding principle framework of intelligent landscape design based on climate adaptability factors and nonlinear random matrix is shown in Figure 1. It can be seen from the figure that the climate adaptive factors considered in this paper include the temperature and humidity in the garden area, the wind complaint in the garden area, the hydrology in the garden area, the solar radiation in the garden area, and the air pollutants in the garden area. Based on the above climate adaptive factors, this paper makes a parametric statistical analysis of the nonlinear random matrix. In the specific analysis process of random matrix, the Gaussian orthogonal system is mainly used in this paper. Its main analysis steps include the construction of the orthogonal system of landscape climate factors, the characteristic analysis of the system obtained through numerical analysis, and the comparative analysis of theoretical analysis and practical analysis. The corresponding digital design scheme of intelligent landscape mainly includes the target analysis and parametric design of landscape, site environment analysis and parametric design of landscape, intention guidance analysis and design of landscape function, system level scheme design (mainly with the help of digital-aided design and corresponding parametric design), reflection and adjustment of digital design scheme of landscape, and digital design display of landscape (Intelligent landscape display). In the corresponding landscape design, the main digital technical support includes digital analysis software GIS, EA, and RG, which are mainly used for quantitative analysis and environmental simulation of the landscape. In the corresponding landscape digital-aided design software level, the main software used are CAD, Lumion, and other software, which are mainly used to assist in the drawing and processing of the map model and effect map of the landscape. The main software used in the corresponding landscape analysis method is grasshopper, which mainly carries out parametric analysis and discussion on the corresponding landscape based on the data generated by the nonlinear random matrix. In addition to the data processed by the nonlinear matrix, this part of parametric analysis will also
analyze the data, pictures, videos, etc. in the landscape collected by the various sensors. At the corresponding level of digital display of landscape architecture, the main means of application include immersive digital experience, virtual reality digital experience, and functional experience modules of various integrated digital technologies. For the above design modules, links, and function realization, this paper will elaborate and analyze in Sections 3.1 and 3.2.

3.1. Climate Adaptive Factor Analysis of Landscape Architecture Based on the Nonlinear Random Matrix. This section is mainly based on the analysis of the climate factors of landscape design, parameterized through the random matrix, and finally applied the corresponding analysis results to the digital design of landscape. Based on this, the corresponding principle framework of landscape architecture climate adaptive factor analysis based on nonlinear random matrix is shown in Figure 2.

It can be seen from Figure 2 that the climate factors of landscape design specifically analyzed in this paper include radiation factors, circulation factors, geographical factors, and human activity factors. The corresponding radiation factor specifically includes solar radiation, that is, the corresponding heat and the generated heat difference. The corresponding circulation factors include atmospheric circulation factors and synoptic system circulation factors, and the corresponding specific influence factors include many detail factors, such as mean meridional and latitudinal circulation factors, planetary wind belt factors, temperature factors, rainfall factors, and pressure factors. The corresponding geographical factors mainly include the geographical longitude and latitude of the region, land and sea distribution, and the influence of the terrain and circulation of the region. Different climate factors interact and promote each other’s development. Climate factors will affect the layout and site selection of landscape design, further affect the constituent elements of landscape design, and affect the final form of landscape design. In order to further quantify the impact of climate factors on landscape architecture design, the specific analysis of the impact of different climate factors on landscape architecture design is as follows: solar radiation will affect the radiation temperature of the landscape design ground, the photosynthesis of plants, and the lighting of buildings. The impact factors include the angle of the sun, the transparency of the atmosphere, the geographical latitude, and the corresponding altitude. In this paper, this factor is defined as $S$. Temperature mainly affects the comfort degree in landscape architecture, which mainly depends on the solar radiation, the building materials used in landscape design, the greening situation in landscape architecture, and the artificial heat dissipation. Based on this, this paper defines the influencing factor as $T$. Wind condition factors mainly affect the adjustment of temperature, humidity, air circulation in the garden, and human comfort in the garden design. The corresponding influencing factors include atmospheric circulation, seasonal wind, and terrain wind. Based on this, this paper defines the influencing factor as $W$. Relative humidity mainly affects the destructive degree of the environment and the comfort degree of the human

Figure 1: Principle frame diagram of intelligent landscape design based on climate adaptive factors and nonlinear random matrix.
body in landscape design. Its main influencing factors include building materials, terrain environment, etc. and based on this, this paper defines the influencing factor as $D$. Air pollutants mainly affect the life span of plants in the garden, the health of visitors, and the quality of human life. The specific impact factors include urban heat island effect, smoke hazard, agricultural combustion problems, automobile exhaust, and corresponding industrial pollution emissions. Based on this, this paper defines the impact factor as $A$.

Based on the above-mentioned climate impact factors of landscape design, random matrix analysis is carried out. Considering that the relevant impact factors are undirected network nodes, the corresponding parametric mapping relationship is shown in $Q = [S, W, D, T, A]$.

Based on the above mapping relationship formula, the short-distance correlation calculation formula of the corresponding impact factors is set as shown in formula (2). The shorter the corresponding distance is, the closer the correlation is. In landscape design, we can consider local conditions according to the corresponding factor distance, so as to realize the optimization of the design.

$$L_1^2 + L_2^2 + \cdots + L_i^2 = |Q(a)|^2 - |Q(b)|^2.$$ (2)

Based on the above correlation analysis, it is necessary to fully consider the climate factors in the actual landscape design, and conduct quantitative analysis and processing based on the climate adaptive factors based on random matrix parameterization proposed above, so as to provide the reference and optimization for intelligent landscape design.

3.2. Design of the Image and Video Acquisition System Based on the Visual Intelligent Sensor. Based on the above analysis and research on climate adaptability factors and relevant theories of nonlinear matrix, the practical design analysis is carried out based on the outdoor garden of a company. The corresponding design analysis principle block diagram is shown in Figure 3.

It can be seen from the figure that the main designs include digital parameter analysis and research, site environment parametric analysis and research (including climate factor parametric analysis), garden landscape environment design, and intelligent display design of the park.

The corresponding digital parameter analysis and research mainly includes regional environmental analysis and research, regional natural environment analysis and research, and regional human environment analysis and research. In this part, it is necessary to collect regional natural environment information, spatial data information, and human economic data information, and establish elevation data model, slope model, aspect model, rainwater distribution model, and solar sunshine simulation model, solar radiation analysis model, wind environment analysis model and landscape vision analysis model, etc. in the actual design of this part, it is necessary to fully consider the integration and utilization of site resources, maximize the use of regional environmental resources, give full play to the advantages and
convenience of the resources themselves, and protect the regional ecology to the greatest extent.

At the corresponding site environment parameterization analysis and research level, it mainly includes slope aspect analysis, slope analysis, elevation analysis, rainwater runoff analysis, and visual margin correlation analysis. At the same time, it also focuses on the climate factor parameterization analysis. Rhino software is mainly used for auxiliary parameterization analysis in the corresponding elevation analysis to fully obtain the terrain curve visualization model, so as to convert the corresponding elevation change into interval change; the corresponding interval is converted into parameter form. In the establishment of the corresponding water level model, the corresponding contour lines are separated and processed and converted into numerical parameters, and then filtered and processed through the corresponding screening arithmetic unit, so as to simulate the changes related to the water level in the park. In the corresponding slope analysis, rhino and grasshopper software are mainly used for processing and analysis, so as to further grasp the changes of relevant slopes in the garden. In this part, the parametric analysis of the most core climate factors is mainly processed and analyzed with the help of the nonlinear random matrix theory. The climate factors mainly considered include radiation factors, circulation factors, geographical factors, and human activity factors. When actually dealing with the influence factors of the climate adaptability factors of the company's landscape design, the corresponding radiation factors include the solar radiation, that is, the corresponding heat and the generated heat difference. The corresponding circulation factors include atmospheric circulation factors and synoptic system circulation factors, and the corresponding specific influence factors include many detail factors, such as mean meridional and latitudinal circulation factors, planetary wind belt factors, temperature factors, rainfall factors, and pressure factors. The corresponding geographical factors mainly include the geographical longitude and latitude of the region, land and sea distribution, and the influence of the terrain and circulation of the region.

At the research level of the corresponding landscape environment design, the main content is the design of visual margin. The landscape circumference based on the corresponding design visual margin is shown in Figure 4. From the figure, it can be seen that it mainly includes the analysis of visual field and line of sight. At the corresponding horizon

---

**Figure 3:** Framework diagram of intelligent landscape design based on climate adaptive factors and nonlinear random matrix.

**Figure 4:** Visual margin of intelligent landscape design.
analysis level, it mainly includes close range, midrange, and long range, which is mainly based on the important central point in the garden as the origin for processing and analysis. At the corresponding line of sight analysis level, it is mainly the flexible use of spatial techniques such as spatial infiltration and changing scenery step by step.

At the corresponding level of intelligent display design in the park, based on virtual reality technology, the corresponding two-dimensional design drawings are converted into three-dimensional design models, and the specific garden construction is guided based on the three-dimensional models, so as to provide scientific theoretical guidance for the final reasonable scheme design. At the same time, through the display and experience of virtual reality technology, the participants can better understand the current garden design concept and design aesthetics.

4. Practice Simulation and Conclusion Analysis

Based on the relevant design ideas in the third section, this section carries out actual design simulation and comparative research based on the exterior landscape garden of a company. The main design schemes are as follows:

In view of the elevation design level, combined with the corresponding situation of the company's exterior landscape, a certain area of waterscape is built to create a relatively good waterscape environment. At the same time, the vision of the company's exterior landscape garden is increased through land leveling.

At the corresponding slope analysis level, soil consolidation measures are mainly taken to change the original road path and add a large number of pedestrian roads.

At the corresponding horizon analysis level, enhance the visibility around the waterscape, and actively create a broad and soothing vision.

At the corresponding functional division level, set up green areas, water scenic spots, parking areas, landscape areas, rest areas, and interactive activity sites. Realize the separation of people and vehicles in the corresponding road design, and actively increase the continuity of the water scenic area in the corresponding water scenic area design level, so as to maintain the relatively humid air on the site, so as to meet the climatic factor requirements of the company's outdoor gardens.

At the design level of corresponding greening plants, cold-resistant, natural, simple, and drought-resistant plants are mainly selected. At the same time, green is the main design idea, and a large number of evergreen plants and deciduous plants are matched.

At the corresponding digital design level, a large number of intelligent control systems, sensors, and wireless sensor
Figure 6: Comparison and analysis of garden environmental protection and energy conservation column chart.

Figure 7: Comparative analysis of garden comfort column chart.
networks are added to realize the intelligent and digital management of landscape. At the level of corresponding irrigation system and maintenance system, sensors and electronic monitoring equipment are used for real-time monitoring and management of soil, air temperature and humidity, wind speed and direction in the park, and real-time monitoring and analysis are carried out through big data calculation.

Based on the above design, this paper compares it with the traditional garden design. The main indicators of comparative analysis include the degree of wisdom of the garden, the degree of environmental protection and energy conservation of the garden, and the degree of comfortable experience of the garden. The corresponding line charts of comparative analysis are shown in Figures 5–7.

Figure 5 shows the comparison curve between the intelligent landscape design scheme proposed in this paper and the traditional landscape design scheme. From the figure, it can be seen that the scheme proposed in this paper has obvious advantages over the traditional scheme in terms of design intelligence, management intelligence, experience intelligence, and maintenance intelligence.

As shown in Figure 6, the comparison curve of the degree of environmental protection and energy conservation between the intelligent landscape design scheme proposed in this paper and the traditional landscape design scheme is shown. From the figure, it can be seen that the scheme proposed in this paper has certain advantages over the traditional scheme in terms of design energy conservation, maintenance energy conservation, management energy conservation, and construction energy conservation.

As shown in Figure 7, the comparison curve of the degree of comfort experience between the intelligent landscape design scheme proposed in this paper and the traditional landscape design scheme is shown. From the figure, it can be seen that the scheme proposed in this paper has obvious advantages over the traditional scheme in terms of visual experience comfort and experience embodiment comfort.

Based on the above experimental results and analysis, it can be concluded that the proposed video image data acquisition and analysis scheme has obvious advantages in performance, filtering quality, and corresponding system efficiency compared with the traditional scheme. Therefore, the scheme proposed in this paper has practical value and further promotion research value, which is of great significance to further improve the image and video processing technology.

5. Conclusion

This paper mainly analyzes the problems of traditional landscape architecture design, and gives the current situation of digital landscape architecture design. In view of the corresponding current problems, this paper fully considers the role of climate factors such as solar radiation, temperature, wind conditions, relative temperature and humidity and air pollutants in landscape design. At the same time, various design factors in landscape design are quantified and statistically analyzed by using the principle of nonlinear random matrix, so as to further optimize the index distribution of balanced design factors. Thus, the landscape design scheme is optimized. In the actual principle design, this paper adopts the logic idea of digital garden design, based on the design process of garden logic design, garden design foundation preparation, garden design environment analysis, digital garden design results display, and establishes a parametric digital garden model, so as to realize the digital design and simulation of intelligent garden. In the corresponding practical simulation part, this paper carried out an example verification based on the interior and exterior landscape design of a company, and realized the establishment of the parametric analysis model of the case based on parametric and visual-related programmable software, thus completing the simulation design of functional components such as garden road layout optimization design, garden greening planting design, garden landscape visual creation effect design, and garden numerical service design. The experimental results show that the intelligent landscape design based on climate adaptability and nonlinear matrix has advantages over the traditional design scheme at all levels, and it has certain popularization and practical significance. In the subsequent research, this paper will focus on the introduction of artificial intelligence and other related algorithms in the intelligent landscape design, focusing on the details of the design and the design ideas. At the same time, in the actual design, it will also focus on the problem of design energy consumption, and study the energy-saving problem of intelligent landscape design in the design and the energy-saving problem of subsequent landscape operation.

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 declare that they have no conflicts of interest.

Acknowledgments

This work was supported by Henan Province Teaching Reform Project: Innovation and Practice of Talent Training Mode for New Construction Engineering Majors in the Digital Age (No. 20215/GLX529).

References

[1] Z. Song, “Study of the landscape pattern of Shuiyu village in Beijing, China: a comprehensive analysis of adaptation to local microclimate,” Sustainability, vol. 14, no. 40, pp. 112–123, 2021.
[2] M. Liu and S. Nijhuis, “Mapping landscape spaces: methods for understanding spatial-visual characteristics in landscape design,” Environmental Impact Assessment Review, vol. 82, no. 4, pp. 56–63, 2020.
[3] R. Pasini, “A dialectics of ecology and design in the Reform of contemporary landscapes,” Sustainability, vol. 14, no. 22, pp. 11–23, 2022.
[4] M. Allahyar and F. Kazemi, "Effect of landscape design elements on promoting neuropsychological health of children," *Urban Forestry and Urban Greening*, vol. 65, no. 4, Article ID 127333, 2021.

[5] J. Andrew Petersen, J. W. Paulich, F. Khodakarami, S. Stavroula, and V. Kumar, "Customer-based execution strategy in a global digital economy," *International Journal of Research in Marketing*, vol. 39, no. 9, pp. 531–542, 2022.

[6] W. McWilliam, A. Wesener, A. Sukuman, and RD. Brown, "Reducing the incidence of skin cancer through landscape architecture design education," *Sustainability*, vol. 12, no. 22, pp. 9402–9411, 2020.

[7] G. Gómez-García, F. J. Hinojo-Lucena, M. P. Cáceres-Reche, and M. Ramos Navas-Parejo, "The contribution of the flipped classroom method to the development of information literacy: a systematic review," *Sustainability*, vol. 12, no. 18, pp. 7723–7728, 2020.

[8] R. Erfanifar, K. Sayevand, and H. Esmaeili, "A novel iterative method for the solution of a nonlinear matrix equation," *Applied Numerical Mathematics*, vol. 153, no. 4, pp. 199–204, 2020.

[9] Z. Yang, Y. Sun, Y. Liu, and J Cui, "Prediction on nonlinear mechanical performance of random particulate composites by a statistical second-order reduced multiscale approach," *Acta Mechanica Sinica*, vol. 37, no. 4, pp. 570–588, 2021.

[10] Y. Hosoe, D. Peaucelle, and T. Hagiwara, "Linearization of expectation-based inequality conditions in control for discrete-time linear systems represented with random polynomials," *Automatica*, vol. 122, no. 4, Article ID 109228, 2020.

[11] D. Chen, P. Marzocca, J. Wang, Q. Xiao, Z. Zhan, and L. Ma, "Linear/nonlinear hydroelastic modeling of a rigid-flexible coupling multibody system based on a transfer matrix method," *Ocean Engineering*, vol. 216, no. 4, Article ID 107791, 2020.

[12] Y. Zhao, S. Bin, and G. Sun, "Research on information propagation model in social network based on BlockChain," *Discrete Dynamics in Nature and Society*, vol. 2022, pp. 1–14, Article ID 7562848, 2022.

[13] M. M. Abdel-Aziz, H. Algarni, H. E. Ali et al., "A novel polymer/ceramic composite film for different optical applications: optical linear, nonlinear, and limiting properties," *Physica Scripta*, vol. 96, no. 5, Article ID 055804, 2021.

[14] V. Yaghoubi, M. Silani, H. Zolfaghari, M. Jamshidian, and T. Rabcezuk, "Nonlinear interphase effects on plastic hardening of nylon 6/clay nanocomposites: a computational stochastic analysis," *Journal of Composite Materials*, vol. 54, no. 6, pp. 753–763, 2020.

[15] V. Myroshnychenko, S. Smirnov, P. M. Mulavarickal Jose, C. Brosseau, and J. Forstner, "Nonlinear dielectric properties of random paraelectric-dielectric composites," *Acta Materialia*, vol. 203, no. 4, Article ID 116432, 2021.

[16] G. Sun, C. C. Chen, and S. Bin, "Study of cascading failure in multisubnet composite complex networks," *Symmetry*, vol. 13, no. 3, p. 523, 2021.

[17] J. Alencar, J. B. Pacheco, J. dos Santos Silva, S. O. F. Silva, and AE. Guimaraes, "Influence of climatic factors on psorophora (janthinosoma) albigena in pantanal landscape, mato grosso state, Brazil," *Journal of the American Mosquito Control Association*, vol. 34, no. 3, pp. 177–181, 2018.

[18] S. Šenhořa, M. Zeps, R. Matisons, and J. Smilga, "Effect of climatic factors on tree-ring width of Populus hybrids in Latvia," *Silva Fennica*, vol. 50, no. 13, pp. 11–23, 2016.

[19] S. K. Dong, W. Sha, X. K. Su et al., "The impacts of geographic, soil and climatic factors on plant diversity, biomass and their relationships of the alpine dry ecosystems: cases from the Aerjin Mountain Nature Reserve, China," *Ecological Engineering*, vol. 127, no. 2, pp. 170–177, 2019.

[20] R. S. Thompson, K. H. Anderson, R. T. Pelliter, L. E. Strickland, L. S. Shafer, and Pj. Bartlein, "Assessing the uncertainties in climatic estimates based on vegetation assemblages: examples from modern vegetation assemblages in the American Southwest," *Quaternary Science Reviews*, vol. 262, no. 4, Article ID 106880, 2021.

[21] A. Singh, L. Reinhardt, and E. Foufoula-Georgiou, "Landscape reorganization under changing climatic forcing: results from an experimental landscape," *Water Resources Research*, vol. 51, no. 6, pp. 4320–4337, 2015.

[22] B. A. Paula, "Late quaternary landscape evolution in the Atlantic Plateau (Brazilian highlands): tectonic and climatic implications of fluvial archives," *Earth-Science Reviews*, vol. 207, no. 4, Article ID 103228, 2020.

[23] S. Gao, Q. Wu, Z. Zhang, and X. Xu, "Impact of climatic factors on permafrost of the Qinghai–Xizang Plateau in the time-frequency domain," *Quaternary International*, vol. 374, no. 6, pp. 110–117, 2015.

[24] A. Tovend, M. Drašković, J. Tomić, D. Dodig, J. Boskovic, and V. Zecevic, "Utilization of Mixolab for assessment of durum wheat quality dependent on climatic factors," *Journal of Cereal Science*, vol. 69, no. 11, pp. 344–350, 2016.

[25] A. Madad, A. Gharghozoul, H. Majedi, and S. Monavari, "A quantitative representation of the urban green building model, focusing on local climatic factors by utilizing monetary valuation," *Economic Geology*, vol. 161, no. 6, pp. 61–72, 2019.

[26] R. Shenkman and A. Ponomaryov, "Advantages of using BIM (BIM-technology) for the design and construction of subsoil use industry buildings and structures," *Journal of Physics: Conference Series*, vol. 1928, no. 1, Article ID 0120552, 2021.

[27] A. Kamari, A. Paari, and H. I. Torvund, "BIM-enabled virtual reality (VR) for sustainability life cycle and cost assessment," *Sustainability*, vol. 12, no. 3, pp. 677–75, 2020.

[28] Y. Deng, J. C. Cheng, and C. Anumba, "Mapping between BIM and 3D GIS in different levels of detail using schema mediation and instance comparison," *Automation in Construction*, vol. 67, no. 6, pp. 1–21, 2016.

[29] I. Hijazi, A. Donaubauer, and T. Kolbe, "BIM-GIS integration as dedicated and independent course for geoinformatics students: merits, challenges, and ways forward," *ISPRS International Journal of Geo-Information*, vol. 7, no. 8, pp. 219–224, 2018.