Hindawi
Mathematical Problems in Engineering
Volume 2022, Article ID 3734946, 9 pages
https://doi.org/10.1155/2022/3734946

Research Article

Green Building Project Cost Budgeting and Cost Control Integrating Interactive VR Genetic Algorithm

Li Zhou[1] and Shijiu Song[2]

[1]*School of Finance and Business, Jinan Vocational College, Jinan 250103, Shandong, China*
[2]*Jinan Vanke Enterprise Co. Ltd, Jinan 250014, Shandong, China*

Correspondence should be addressed to Shijiu Song; 18126392@bjtu.edu.cn

Received 18 April 2022; Accepted 12 May 2022; Published 29 June 2022

Academic Editor: Xiantao Jiang

The development of buildings in the future will tend to the direction of green buildings. At present, most of the calculations of their costs usually use empirical models, which lack the basis for quantitative prediction. For the purpose of improving the accuracy of budget and control of project cost for green buildings, this paper applies interactive virtual reality (VR) genetic algorithm and analyze project budget accordingly. The prediction accuracy is effectively increased based on the mathematical analysis model. Finally, the test results suggest that the proposed algorithm can effectively improve the cost control efficiency and engineering quality of green buildings and reduce the construction cost of buildings.

1. Introduction

Green buildings are gradually being loved by many users, mainly through the proportion of different green areas in green buildings. Green buildings can not only give people a warm, comfortable and environmentally friendly living perception but also have flexibility and economy. Now is the era of intelligence. Introducing the interactive VR genetic algorithm in the actual 3D of the architectural cultural engineering cost model can fully exert its technical edge, which is the status quo and future trend for assessing the performance and importance of architectural cultural engineering cost. In particular, as virtual technology with robust development is introduced, the interactive VR genetic algorithm is used in the real-world 3D TV model to address the growth in the era at present [1–3]. Modern industry focuses on the study status of 3D virtual architecture and VR. It is a tremendous challenge to construct mathematical model and perform geometric programming for each virtual building, which is still demonstrated in a conventional way for real estate in extensive applications. Domestic and foreign researchers have conducted massive studies through virtual building simulation. Comprehensive research on 3D virtual simulation with the support, model, and simulation by OpenGL, the practical level and data on movement can be interpreted to establish the model for buildings and simulate the movement virtually. However, there are major shortcomings in the two aspects of communication and convenient tools because the memory of this technology is large, and the transmission cannot achieve the expected effect.

After in-depth research on all aspects of building construction, this paper proposes an analysis algorithm for green building project cost budgeting and cost control. Through the use of interactive VR genetic algorithms, from the perspectives of construction period, labor cost, material cost, safety investment, etc., utilize the objective function, collect the construction schedule of the construction project, and number the grids in a certain order to achieve the purpose of saving project costs and reducing budget input.

2. Related Work

There are many influencing factors for project cost of green buildings. The top design elements of green building projects and the skill level of the constructors of green building projects are these human factors that affect the price of green building projects. Project changes, national policy control, and natural influencing factors are all objective influencing factors, and no factor should be leaked during the budgeting process. The overall price of green construction projects for which influencing factors have not been calculated during the price budgeting and cost control process will be affected, and the estimation accuracy will decrease. In the process of building construction, the increase in the number of building floors and building area will affect the cost of green building projects, and changes in materials purchased during the construction process and changes in construction personnel expenditures affect the budget and control of project cost for green buildings. Therefore, in the process of reasonable adjustment and control of project cost for green buildings, the potential influencing factors should be considered comprehensively; labor and material costs should be incorporated in the project cost budget account so as to better stabilize the construction project advance. The green building project cost budget is sent to the cost control center. The subjective, objective, and dynamic factors of the cost of the building project are usually regarded as the input value of the system parameters. It is necessary to ensure higher accuracy in the budget and control of project cost for green buildings [4–6].

3. Algorithms and Model Building

3.1. Immersive VR Genetic Algorithm. The immersive VR genetic variable is represented by a three-element array $(r_1, r_2, r_3) r_1 < r_2 < r_3$ composed of cleared numbers, with the subordinate function

$$\mu(x) = \begin{cases} \dfrac{x - r_1}{r_2 - r_1}, & r_1 \le x \le r_2, \\ \dfrac{x - r_3}{r_2 - r_3}, & r_2 \le x \le r_3, \\ 0, & \text{others}. \end{cases} \tag{1}$$

Suppose immersive VR genetic $\alpha = (a_1, a_2, a_3)$, $\beta = (b_1, b_2, b_3)$ is based on the expansion principle of VR genetic number addition and multiplication,

$$\mu_{\alpha+\beta}(z) = \sup\left\{\min\left\{\mu_{\overline{\alpha}}(x), \mu_{\overline{\beta}}(y)\right\} | z = x + y\right\}$$
$$= \begin{cases} \dfrac{z - (a_1 + b_1)}{(a_2 + b_2) - (a_1 + b_1)}, & a_1 + b_1 \le z \le a_2 + b_2, \\ \dfrac{z - (a_3 + b_3)}{(a_2 + b_2) - (a_3 + b_3)}, & a_2 + b_2 \le z \le a_3 + b_3, \\ 0, & \text{others}. \end{cases} \tag{2}$$

That is,

$$\overline{\alpha} + \overline{\beta} = (a_1 + b_1, a_2 + b_2, a_3 + b_3). \tag{3}$$

By $\mu_{\lambda\overline{\alpha}}(z) = \sup\{\mu_{\overline{\alpha}}(x) | z = \lambda x\}$, we get

$$\lambda\overline{\alpha} = \begin{cases} (\lambda a_1, \lambda a_2, \lambda a_3), \lambda \ge 0 \\ (\lambda a_4, \lambda a_3, \lambda a_1), \lambda < 0. \end{cases} \tag{4}$$

The constraints for immersive VR genetics, which is stochastic programming, are random parameters, where the chance indicates the probability for the establishment of a constraint; a chance is deemed a constraint in a genetic environment based on immersive VR genetic programming. Random and immersive VR genetic control programming has served as a powerful tool to address the optimization issue of random and immersive VR genetic parameters. This model is a general form.

$$\begin{cases} \max\limits_{x} & f(x, \xi, \eta), \\ \text{s.t.} & g_j(x, \xi, \eta) \le 0, \quad j = 1, 2, \ldots, m. \end{cases} \tag{5}$$

Based on the interactive VR genetic algorithm, ant pheromone is updated according to the following rules per loop to ensure the identification and use of the optimal solution fully:

$$\tau_{ij}(t + n) = (1 - \rho) \times \tau_{ij}(t) + \Delta\tau_{ij}(t),$$
$$\Delta\tau_{ij}(t) = \sum_{k=1}^{m} \Delta\tau_{ij}^{k}(t),$$
$$\Delta\tau_{ij}^{k} = \begin{cases} \dfrac{Q}{L_k}, & \text{ant } k \text{ go through } (i, j), \\ 0, & \text{otherise}. \end{cases} \tag{6}$$

Here, Q is a constant, which indicates the concentration of information elements and can influence the speed of convergence according to the algorithm; L_k is the kth ant's distance of movement in this loop.

The flow of interactive VR genetic algorithm is shown in Figure 1.

When the ants are looking for food, their path can be sensed by other ants in the "pheromone" and move to a place with a high concentration of this substance. In some respects, when an ant chooses a path from different paths, the probability that a large number of paths chosen by the ants in the front will be selected by the ants in the back becomes higher, and a lot of information indicating the short path to achieve the goal is left on the path element [7, 8].

Basic parameters of interactive VR genetic algorithm: m represents the number of artificial ants. Project indicators d_{ij} represents the distance between two projects $i, j \in (1, n)$. $\tau_{ij}(t)$ represents the content of pheromone remaining on the path ij from the ant colony passing at point t. Set $\tau_{ij}(0) = \mathrm{C}$ ants. The probability formula for selecting a path is as follows:

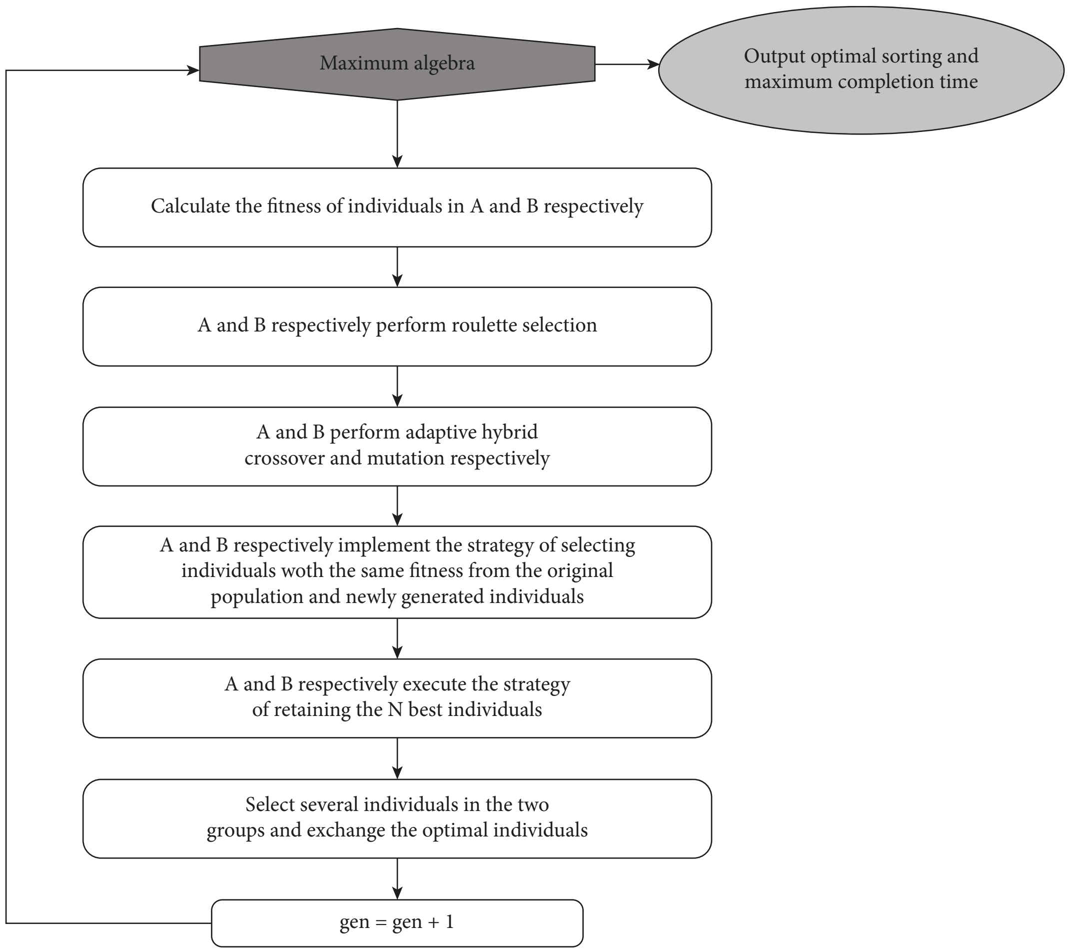

Figure 1: Interactive virtual.

$$\begin{cases} p_{ij}^{k}(t)\dfrac{\tau_{ij}^{\alpha}(t)\eta_{ij}^{\beta}(t)}{\sum_{s\in \text{allowed}_k}\tau_{is}^{\alpha}(t)\eta_{is}^{\beta}(t)}, & j = \text{allowed}_k, \\ p_{ij}^{k}(t) = 0, & \text{otherwise}. \end{cases} \tag{7}$$

α is the information heuristic factor, which indicates the relative significance of relevant path. Regarding the expected heuristic factor, β is the relative significance of expected values of ants transferring from project i to project j. allowedk = {C-tabuk} is a project where ant k can be selected at point t. tabuk ($k = 1, 2, 3,$ m) is a taboo table, which records the projects currently passed by ant k. η_{ij} is heuristic information showing the expected value of the ants transferring from project i to project j.

Use the Pareto optimal solution to reorder the solutions, assign adaptive values, calculate the shared function value, and place the Pareto optimal solution in the noninferior optimal area. The following uses a similar classification principle:

① Divide the population P into seed groups by means of noninferior stratification.

② The first layer is defined as the optimal noninferior group, and the fitness value given to each individual in the first layer is fi = N (N is the number of seed groups).

③ In the method of using the sharing function in each layer, first calculate the standardized Euler distance between the individual i and the individual j in the first layer.

④ Calculate the value of the sharing function as follows:

$$d_{ij} = \sqrt{\sum_{s=1}^{n}\left(\frac{x_s^{(i)} - x_s^{(j)}}{x_s^{\max} - x_s^{\min}}\right)^2},$$

$$\text{sh}(d_{ij}) = \begin{cases} 1 - \left(\dfrac{d_{ij}}{\sigma_{\text{share}}}\right)^{\alpha}, & d_{ij} \le \sigma_{\text{share}}, \\ 0, & \text{other}. \end{cases} \tag{8}$$

⑤ Calculate the value of the first-level individual sharing function according to the following formula:

$$\mathrm{nc}_i = \sum_{j=1}^{u(v_i)} \mathrm{sh}\left(d_{ij}\right). \quad (9)$$

⑥ Adjust the individual fitness value: $f_i = f_i/\mathrm{nc}_i$.

⑦ The original fitness value of each body in the second layer is $f_i = N - \rho/N$. Use the first layer method to adjust the individual fitness value in the second layer, and so on.

3.2. Construction of Cost Prediction Model. The issues of constrained flow network are how to deploy optimal location and select the building for allocation of personnel to all preset branches. Due to the incomplete constraint, a dual task is required in drift network. The flow of unclear personnel should be controlled while optimal personnel allocation and structure selection are determined.

Issues in the constraint flow network: given the known distribution of personnel in the network, the discussion of constraints is omitted. The objective function for the issues can be expressed by (10), with the constraints

$$\begin{cases} \sum_{j=1}^{b}\left(R_j\left|Q_j\right|Q_j + \mathrm{HR}_j - \mathrm{HN}_j - \mathrm{HF}_j\right) = 0, \\ \mathrm{HR}_j, \quad \mathrm{HN}_j \geq 0, \ j = 1, \ldots, b. \end{cases} \quad (10)$$

The above model is evidently nonlinear programming, in which a binary variable Y_j can be introduced to convert the model into linear programming and obtains the relevant value to transform the objective function.

$$Y_j = \begin{cases} 1, & \mathrm{HF}_j > 0, \\ 0, & \text{other}, \end{cases} \quad C_p Q_j = a_j, \qquad \mathrm{Minimize}Z = \sum_{j\in L} a_j \mathrm{HF}_j + \sum_{j\in L} C_j Y_j. \quad (11)$$

The constraints are

$$\begin{cases} \sum_{j=1}^{b} b_{ij}\left(R_j\left|Q_j\right|Q_j + \mathrm{HR}_j - \mathrm{HN}_j - \mathrm{HF}_j\right) = 0, \\ \mathrm{HR}_j, \quad \mathrm{HF}_j \leq 0, \ j = 1, \ldots, b, \\ \mathrm{HF}_j \leq d_j Y_j, \quad j \in L, \\ Y_j = (0, 1), \end{cases} \quad (12)$$

where $d_j = \max \mathrm{HF}_j$, when $\mathrm{HF}_j \neq 0, Y_j = 1$; $\mathrm{HF}_j = 0, Y_j = 0$. So, when $Y_j = 1$, ZLarger values can appear.

Let the branch flow with the minimum (L_j) and the maximum (U_j) be unclear branches, which can be expressed by the following objective function:

$$MinZ = \sum_{j=1}^{L} C_j Q_j \mathrm{HF}_j + \sum_{j=1}^{L} C_j. \quad (13)$$

The constraints are

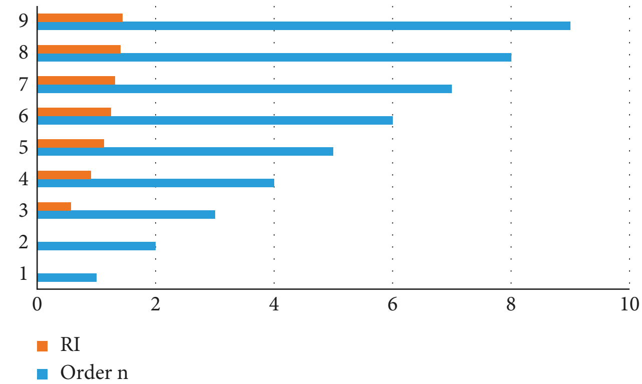

Figure 2: Values of RI for different orders.

$$\begin{cases} \sum_{j=1}^{b} a_{ij} Q_j = 0, \\ \sum_{j=1}^{b} b_{ij}\left(R_j\left|Q_j\right|Q_j + \mathrm{HR}_j - \mathrm{HN}_j - \mathrm{HF}_j\right) = 0, \\ L_j \leq Q_j \leq U_j, \\ \mathrm{HR}_j \geq 0, \\ X_j = (0, 1), \\ Q_j \mathrm{HF}_j \geq P_j, \quad X_j = 1, \\ Q_j \mathrm{HF}_j = P_j, \quad X_j = 0. \\ j = 1, \ldots, b. \end{cases} \quad (14)$$

In the formula, P_j is the minimum power allowed on branch j.

Due to the nonlinearity of the objective function and constraints above, it should be converted to linear programming. Firstly, decompression is determined, followed by solving each subset. Aggregate L for X_j is formed by all solutions as elements. Finally, the optimal solution for the linear programming is obtained. The method is demonstrated by a specific example as follows.

Determination of indicator weight: in general, it is necessary to keep the building structure in 3D visualization of real-world buildings, which are transferred from the old to new site, provided that their appearance, such as longitudinal/lateral displacement and rotation, is kept intact. Technically, the comprehensive transfer is independent based on the individual building, which should have its integrity after enhancement to address the movement friction and jitter interference; i.e, real-world 3D visualization. Two assessment elements are compared to establish the determination mix with the specific form:

$$B = \begin{pmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n} \\ \cdots & \cdots & \ddots & \cdots \\ b_{n1} & b_{n2} & \cdots & b_{nn} \end{pmatrix}, \quad (15)$$

where b_{ij} is for A_k.

Eigenvalues and eigenvectors in line with $\mathrm{BW} = \lambda_{\max} W$ are calculated for decision matrix B. Here, the maximum feature path of B is $\lambda_{\max}$, with specific steps: (1) the product (M_i) of elements in each row of matrix B is calculated:

$$M_i = \prod_{j=1}^{n} b_{ij}\,(i = 1, 2, \ldots, n). \tag{16}$$

The nth root (M_i) of $\overline{W}_i$ is obtained:

$$\overline{W}_i = \sqrt[n]{M_i}\,(i = 1, 2, \ldots, n). \tag{17}$$

Normalize the vector $\overline{W} = (\overline{W}_1, \overline{W}_2, \ldots, \overline{W}_n)^T$:

$$\begin{aligned} W_i &= \frac{\overline{W}_i}{\sum_{j=1}^{n} W_j}\,(i = 1, 2, \ldots, n), \\ \lambda_{\max} &= \frac{1}{n} \sum_{i=1}^{m} \frac{(\mathrm{BW})_i}{W_i}. \end{aligned} \tag{18}$$

The consistency index (CI) is obtained:

$$\mathrm{CI} = \frac{\chi_{\max} - n}{n - 1}. \tag{19}$$

The random matching rate (CR) is used to verify the definite matrix matching, and the matrix with $\mathrm{CR} = \mathrm{CI}/\mathrm{RI} \leq 0.10$ is considered satisfactory matching; otherwise, the judgment matrix is adjusted until it complies with the detection conditions (Figure 2).

Design of cost prediction algorithm: with the cost budget of green building projects as the focus, this paper has laid a foundation for completing the relevant green buildings smoothly. Generally, 3D visualization of a real-world green building should ensure its structure intact and transfer it from the old to new sites, provided that its appearance (such as longitudinal/lateral displacement and rotation) remains complete. Overall, the transfer is independent based on the technical concept of individual green buildings. After enhancement, the integrity of the relevant green buildings should be maintained to address the movement friction and jitter interference. The time series of the growth index for the project cost is based on a linear model, using interactive VR genetic algorithm [9–11], the corresponding cost of the construction project can be controlled in the corresponding space embedding dimension, and the average price of the market price of materials is collected as follows m (project budget increase) τ indicates that the reconstruction vector trajectory matrix in this space can be expressed by the following formula:

$$L = \begin{bmatrix} x_1^T \\ x_2^T \\ \vdots \\ x_N^T \end{bmatrix} = \begin{bmatrix} x_1 & x_{1+\tau} & \cdots & x_{1+(m-1)\tau} \\ x_2 & x_{2+\tau} & \cdots & x_{2+(m-1)\tau} \\ \vdots & \vdots & \ddots & \vdots \\ x_{N-1} & x_{N-1+\tau} & \cdots & x_{N-1+(m-1)\tau} \end{bmatrix}. \tag{20}$$

According to the construction project budget evaluation model, the eigen-decomposition can be obtained and the single-factor gray can be used for prediction, and the singular value can be solved for L. That is, U and C are mutually orthogonal matrices. Satisfy $L = U \cdot S \cdot C$, $C = (c_1, c_2, \ldots, c_n)$, S represents the singular value of L, which is in line with the process of solving the relevant data information of green buildings:

$$S = \mathrm{diag}(\sigma_1, \sigma_2, \ldots, \sigma_n), \sigma_1 \geq \sigma_2 \geq \cdots \geq \sigma_n \geq 0. \tag{21}$$

With system data input, the principal component analysis method can be used to solve the subspace matrix X based on the matrix L and the optimal embedding dimension:

$$X = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_N \end{bmatrix} = \begin{bmatrix} a_1^T c_1 & a_1^T c_2 & \cdots & a_1^T c_m \\ a_2^T c_1 & a_2^T c_2 & \cdots & a_2^T c_m \\ \vdots & \vdots & \ddots & \vdots \\ a_N^T c_1 & a_N^T c_2 & \cdots & a_N^T c_m \end{bmatrix}. \tag{22}$$

For the purpose of predicting the project cost more accurately, this paper uses a preestimator to calculate $J_x^{(1)}$, and then $J_x^{(N)}$ can be calculated based on $J_{x_i}^{(N)}$:

$$\begin{aligned} \delta x_{i+1} &\approx J_{x_i}^{(1)} \delta x_i, \\ \delta x_i &= x_{i+1} - x_i. \end{aligned} \tag{23}$$

$X_j\,(x_j \in R^m, j \in 1, 2, \ldots, N)$ and x_i represent the control quantity of project quality and benefit. According to the variable $\{x_i\}_{i=1}^{N}$, the historical record of construction project budget can be calculated. According to $\delta x_{i+1} = x_{j+1} - x_{i+1}$, δx_i and δx_{i+1} can be calculated. The optimal economy and worst economy are represented by F_U and F_V, respectively.

$$\begin{aligned} F_U &= \sum_{j=1}^{M} \min_{j \in N_j} \left(F_{jk}\right), \\ F_V &= \sum_{j=1}^{M} \max_{j \in N_j} \left(F_{jk}\right). \end{aligned} \tag{24}$$

Regarding the scheduling problem of the flow shop of n jobs and m devices, the device processing time for the relevant task is set accordingly. The work schedule sequence is the work completion time on machine k, and the steps to unlock the maximum completion time are as follows:

$$\begin{aligned} &c(J_1, k) = c(J_1, k-1) + t_{J_1 k}; \quad k = 2, 3, \ldots, m, \\ &c(J_i, 1) = c(J_{i-1}, 1) + t_{J_1 1}; \quad i = 2, 3, \ldots, n, \\ &c(J_i, k) = \max\left\{c\left(J_{i-1,k}\right), c(J_i, k-1)\right\} + t_{J_1 k}, \\ &\quad c_{\max} = c(J_n, m). \end{aligned} \tag{25}$$

The fitness function is to evaluate everyone and is the basis for the development of the optimization process. In principle, it guarantees the maximization problem and nonnegativity. And through the linear conversion, power function conversion and exponential conversion of the object function, the matching degree function is obtained [12, 13]. Taking the maximum completion time as the objective function, the adaptability function is expressed as the reciprocal. c^k_{max} indicates the maximum completion time of k individuals v_k is expressed as an adaptive function

$$\text{eval}(v_k) = \frac{1}{c^k_{max}}. \tag{26}$$

Budget-related parameter processing: in the actual application of green buildings, there are also natural environmental waste disposal and the constraints of local climate conditions [14, 15]. Therefore, the main components of the influencing factors use the continuous accumulation of the natural environment's contribution to the cost of green buildings. Cost, the covariance C, used is expressed as:

$$\begin{aligned} C &= \frac{1}{N}\left[X - \overline{X}_l\right]\left[X - \overline{X}_l\right]^T, \\ \overline{X}_i &= \frac{1}{N}\sum_{k=1}^{N} x_{ik}, \\ X &= \left[X_1, X_2, \ldots, X_m\right]. \end{aligned} \tag{27}$$

The actual expression (28) of the calculated prediction scheme is

$$F_i = \sum_{k=1}^{M}\sum_{j\in N_j} x_{jk}F_{jk}. \tag{28}$$

According to the calculated parameters of the project cost budget, the characterization cost prediction model of the project can be constructed. Among them, the correlation $\{F_i, F_U\}$ of the model can be expressed as (29)

$$\begin{aligned} \mu_{F_i} &= a_{F_i} + b_{F_j}\Delta + c_{F_i}\phi, \\ a_{F_i} &= \frac{F_U F_v}{(F_U + F_v)F_i}, \\ b_{F_i} &= \frac{(F_v - F_i)(F_i - F_U)}{(F_U + F_v)F}, \\ c_{F_i} &= \frac{F_i}{F_U + F_v}. \end{aligned} \tag{29}$$

The actual cost level (Q_i) of green building costs needs to meet the most basic production quality of construction projects, the restriction conditions of the engineering quality reliability threshold (), and the construction engineering material utilization efficiency (E_i) need to meet the most basic budget cost of the materials used. The cost of construction personnel (QQ C_i) must meet the maximum budgeted cost (C_{th}) as much as possible [16, 17]. According to the above analysis, the principal component analysis method can be used to categorize all the influencing factors into the forecast range that needs to be considered. Through the processing of the initial data, the green building project can accurately complete the cost budget and cost budget.

Aiming at the problem of the lack of quantitative prediction and analysis of the empirical model used in the traditional construction project cost budgeting process, for

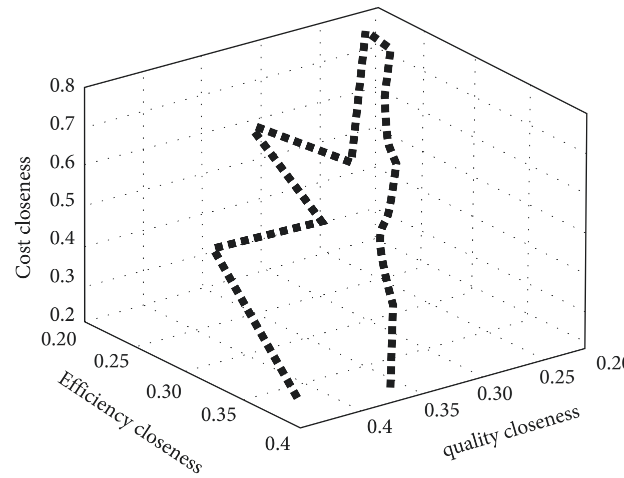

Figure 3: Block map of multiparameter spatial model structure of quality status, efficiency level, and unit cost of new green building design.

the purpose of effectively improving the accuracy of the green building project cost and cost prediction, interactive VR technology must be used on the basis of meeting actual needs. According to the algorithm steps designed above, the construction of the green building cost control model is completed so that the cost is optimized from the budget cost of the construction project, and the green building cost budget expression (30) can be obtained as

$$(\lambda l - S)U = 0. \tag{30}$$

By establishing a number of different green building projects, real-time prediction of its project cost based on the dynamic expenditure of its budget model is realized. After fully grasping the influencing factors to the construction cost of projects, the cost for green buildings can be extracted based on nonlinear feature value. The control model uses the traditional linear model to predict the cost of construction projects. Due to the lack of in-depth analysis and consideration of the impact of cross factors, the prediction accuracy of the model is very low. Therefore, this paper uses the cross-equilibrium design method to fully consider many engineering cost factors to ensure that it is suitable for the nonlinear dynamic forecasting system of the engineering cost. At the same time, the green building cost control cross factor expression (31) between two points is designed as:

$$d_m(0) = \left\|X_m - X_k\right\|. \tag{31}$$

Green building project cost forecast data X_m is mainly converted into X_{m+1} by means of number separation, and the same number of X_k is again separated into X_{k+1}. The index of the change classification of the two vectors can be realized by the cost control model of the project, and the calculation expression (32) is

$$\left\|X_{m+1} - X_k\right\| = \left\|X_m - X_k\right\| e^{\lambda_1}. \tag{32}$$

Because the cost elements of construction projects are affected by the intersection of factors, most of the divided components are the predictive factors of the green building project cost. Using the $X_{m+1}x(t_{n+1})$ in the cross-equilibrium model needs to process and process the obtained data information, and propose irrelevant data. Input the system to complete the cost of green construction projects, eliminate the redundancy of interference information as much as possible, and effectively combine the high-order original space dimensionality reduction processing methods, and more effectively select factors to realize the prediction and evaluation of the construction project expenditure income [18, 19].

4. Simulation Experiment and Result Analysis

The performance of the budget and control algorithm for project cost of new green buildings designed in this paper was tested through simulation experiments, and mathematical simulations were performed using a PC. The construction of the mathematical simulation environment is realized by MATLAB programming. According to the price plan of the new green building project, the specific project price data is analyzed, and the budget and control of project cost for new green buildings are used to complete the project price prediction algorithm on this basis. Simulation, through the construction of a multipurpose approximate mathematical model, obtained the result of the parameter space model of the new green building, and finally realized the accuracy test of the algorithm in terms of global efficiency and cost control [20–23].

During the process of experimental testing, this paper mainly combines the design style of green building, divides it into five different construction units, and conducts the project cost budget test of the construction subunits in turn, mainly aiming to test the rationality of the cost budget for new green building projects and its control accuracy. According to the engineering quality-global efficiency of the design, a mathematical model with similar cost objectives is generated, and the multiparameter spatial model structure diagram of the quality status, efficiency level, and unit cost of the new green building design is calculated (see Figure 3).

According to the experimental results in Figure 3, the project cost budget and cost control model designed in this paper is used to better display in detail the project quality, construction efficiency, and cost budget in relative space. Detailed analysis of the project cost budget and the cost growth exponential function can increase project efficiency and quality while lowering its construction cost. The proposed algorithm and the traditional algorithm are compared and analyzed from the perspective of project cost budget and cost effectiveness, and accurate measurement results can be obtained (see Figure 4). The results indicate that the proposed algorithm can control the cost of new green buildings effectively. According to the test results, a higher budget accuracy can be obtained, thereby effectively reducing the production cost, saving about 35% of the engineering cost, and also effectively improving the quality and efficiency of construction.

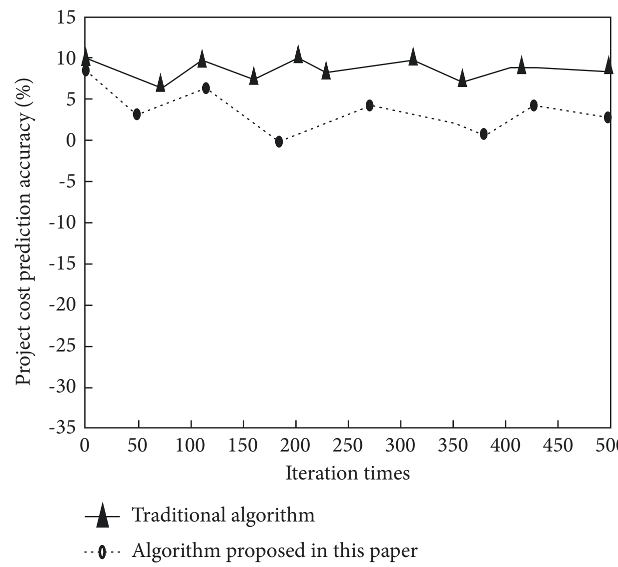

Figure 4: Comparative analysis of cost budget models for new green building projects.

Figure 5: New green building budget cost control site selection investment.

By comparing and analyzing the budget and control of project cost for new green buildings, it can be calculated according to the structure of the project cost budget model. The cost of the new green building project proposed in this paper can be divided into the cost of engineering design, the cost control of construction and material selection. The new green building project needs to focus on energy conservation and environmental protection. When programming the site selection of the building with the idea of sustainable development, it is necessary to fully consider the surrounding traffic facilities, the surrounding environment of lighting and ventilation, green landscape and garden construction, etc., and the land cost may be involved in the process of building cost budget and control. In the process of cost budgeting for new green building projects, on the basis of combining infrastructure, effectively combining the natural infrastructure on-site, the costs shall be effectively reduced as much as possible under the requirements of low-carbon and environmental protection concepts. The cost budget location programming of the new green building designed in this paper is shown in Figure 5.

According to the above budget for new green building budget cost control and location selection, the location and layout of construction projects need to be allocated reasonably, the cost of engineering materials and labor needs to be effectively and reasonably reduced, and the coordinated development of the surrounding environment should be promoted. On the premise of not destroying the ecological environment, the budget and control of project cost for green buildings shall be realized so as to achieve the development goals.

5. Conclusions

Real-time reduction and increase of Interactive VR genetic algorithm is reduced/increased in real time after assessment and specific analysis by the cost review index system for green building projects based on the features (tolerance of fault, scalability, security, and lag in data) of wireless multimedia sensor network. This paper effectively combines the interactive VR genetic algorithm with the characteristics of the green building itself. This paper studies the price budget and cost control of that project. A genetic algorithm based on interactive VR is proposed, which is mainly aimed at new-type green buildings. It completes the construction of mathematical models and the improvement of algorithms based on the characteristics of project price budgets, and further improves the cost accuracy rate of predicting project prices. The research results show that the model can significantly improve cost control efficiency and project quality and reduce construction costs.

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 no conflicts of interest.

References

[1] Z. Wang, "Optimal scheduling of flow shop based on genetic algorithm," *Journal of Advanced Manufacturing Systems*, vol. 21, no. 01, pp. 111–123, 2021.

[2] J. Heger and T. Voss, "Optimal scheduling of agvs in a reentrant blocking job-shop," *Procedia CIRP*, vol. 67, pp. 41–45, 2018.

[3] J. O. Royset and H. Sato, "Route optimization for multiple searchers," *Naval Research Logistics*, vol. 57, no. 8, pp. 701–717, 2010.

[4] M. Schröder and P. Cabral, "Eco-friendly 3D-Routing: a GIS based 3D-Routing-Model to estimate and reduce CO2-emissions of distribution transports," *Computers, Environment and Urban Systems*, vol. 73, pp. 40–55, 2019.

[5] X. Li, W. Jianguo, and J. Yuan, "A new logistics distribution route optimization algorithm for fresh agricultural products based on the fusion of genetic algorithm and ant colony algorithm," *Clinica Chimica Acta*, vol. 42, no. 6, pp. 2428–2432, 2017.

[6] H. W. Zhang, X. Man, Y. Wang et al., *Fish & Shellfish Immunology*, vol. 71, no. 4, pp. 329–337, 2017.

[7] M. W. Jiang and M. Ying, "Study on route selection for hazardous chemicals transportation," *Procedia Engineering*, vol. 71, pp. 130–138, 2014.

[8] J. Wojtusiak, T. Warden, and O. Herzog, "The learnable evolution model in agent-based delivery optimization," *Memetic Computing*, vol. 4, no. 3, pp. 165–181, 2012.

[9] Z. Minjie, Z. Jianwei, and Z. Liwei, "Optimization research on logistics ecological environment system," *Procedia Engineering*, vol. 15, pp. 370–374, 2011.

[10] M. Shahabi, A. Unnikrishnan, and S. D. Boyles, "Robust optimization strategy for the shortest path problem under uncertain link travel cost distribution," *Computer-Aided Civil and Infrastructure Engineering*, vol. 30, no. 6, pp. 433–448, 2014.

[11] Md M. Islam, H. K. Singh, T. Ray, and A. Sinha, "An enhanced memetic algorithm for single-objective bilevel optimization problems," *Evolutionary Computation*, vol. 25, no. 4, pp. 607–642, 2017.

[12] Q. Zhou, X. Xiong, and H. Fang, "Research on distribution center logistics equipment risk management," *Lecture Notes in Electrical Engineering*, vol. 286, pp. 3–16, 2015.

[13] L. Wang, T. Hou, and M. Jiang, "Improved multi-objective evolutionary algorithm for optimization control in greenhouse environment," *Nongye Gongcheng Xuebao/transactions of the Chinese Society of Agricultural Engineering*, vol. 30, no. 5, pp. 131–137, 2014.

[14] K. Sathish Kumar, K. Rajalakhsmi, S. Prabhakar Karthikeyan, and R. Rajaram, "An efficient invasive weed optimization algorithm for distribution feeder reconfiguration and loss minimization," *Advances in Intelligent Systems and Computing*, vol. 324, pp. 37–46, 2015.

[15] S. S. Panwalkar and C. Koulamas, "Three-stage ordered flow shops with either synchronous flow, blocking or no-idle machines," *Journal of Scheduling*, vol. 23, no. 1, pp. 145–154, 2020.

[16] H. B. Tarmizi, M. Daulay, and I. Muda, "Impact of the economic growth and acquisition of land to the construction cost index in north sumatra," *IOP Conference Series: Materials Science and Engineering*, vol. 180, no. 1, Article ID 012004, 2017.

[17] M. Niknam and S. Karshenas, "Integrating distributed sources of information for construction cost estimating using semantic web and semantic web service technologies," *Automation in Construction*, vol. 57, pp. 222–238, 2015.

[18] R. Canesi and G. Marella, "Residential construction cost: an Italian survey," *Data in Brief*, vol. 11, pp. 231–235, 2017.

[19] A. Kaveh, M. Fahimi-Farzam, and M. Kalateh-Ahani, "Optimum design of steel frame structures considering construction cost and seismic damage," *Smart Structures and Systems*, vol. 16, no. 1, pp. 1–26, 2015.

[20] N. Thomas and A. V. Thomas, "Regression modelling for prediction of construction cost and duration," *Applied Mechanics and Materials*, vol. 857, pp. 195–199, 2016.

[21] L. M. Amusan, A. Af Olabi, R. Ojelabi, I. Omuh, and H. I. Okagbue, "Data exploration on factors that influences construction cost and time performance on construction project sites," *Data in Brief*, vol. 17, pp. 1320–1325, 2018.

[22] J. He, Z. Qi, W. Hang, C. Zhao, and M. King, "Predicting freeway pavement construction cost using a back-propagation neural network: a case study in henan, China," *The Baltic Journal of Road and Bridge Engineering*, vol. 9, no. 1, pp. 66–76, 2014.

[23] P. A. Zhao and C. C. Wang, "A comparison of using traditional cost estimating software and BIM for construction cost control," in *of The international conference on construction & real estate management*, pp. 256–264, Kunming, China, September 2014.