Research Article

Research on Management and Efficiency Evaluation of Physical Education Course Selection in Colleges Based on Random Matrix Theory

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Received 16 June 2022; Revised 13 July 2022; Accepted 22 July 2022; Published 22 August 2022

Academic Editor: Ning Cao

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The administration of bodily schooling instructing in schools and universities is creating toward informatization and digitalization. The scholar path determination device can noticeably limit the workload of instructional administrators, enhance the provider satisfactory of instructing management, realise the standardization and transparency of college students’ direction decision process, and meet quite a number of teachers, college students, and managers needed. At the same time, it has additionally considerably multiplied the work effectivity of instructional administration personnel, decreased a lot of human funding in academic administration management, and flawlessly elevated the modern state of affairs of heavy duties in faculty management. Physical coaching route decision in colleges and universities is a huge volume of statistics computing behavior that occurs intensively. Its typical overall performance requirements are very quintessential and have grown to be the most quintessential element of its availability. The overall performance optimization of the path decision gadget is the focal point of the data work of the instructional administration system. This paper first analyses the overall performance issues of the authentic path resolution system, places ahead a multilevel overall performance optimization scheme to optimize and enhance the enterprise process, and decreases the attention of facts processing in the course of direction selection. The stress check device was once used for overall performance test, and the overall performance index was once considerably extended to meet the diagram requirements. The route desire machine meets the requirements of 5000 clients online all thru the route choice pinnacle period, the response speed is lowered to plenty much less than 5 seconds, and the software program server runs stably, which properly meets the route dedication requirements of whole universities.

1. Introduction

With the nonstop building of campus community and the improvement of Internet technology, the instructing administration in faculties and universities is additionally creating in the direction of informatization and digitalization, and the data device in schools and universities is additionally continuously improving. With the growing demand for complete talents, schools and universities ought to cross in the direction of coaching extra complete talents [1]. At present, many faculties and universities have modified from educational 12 months machine to savings system, presenting college students with extra freedom to select courses. In order to domesticate students’ creativity, we must open as many public non-obligatory publications as feasible to increase students’ understanding and enhance their complete quality [2]. The common guide path resolution technique has serious drawbacks. From the distribution of public optionally available publications to departments, teachers’ declaration, the precis and evaluate of the tutorial affairs workplace and the technology of public nonobligatory path schedules, to the distribution of the direction schedules to departments and classes, students’ noncompulsory courses, the centralized enter of the tutorial affairs administration personnel, and the precis to the educational affairs administration
department, the data of the wide variety of optional publications in every course, the arrangement of classification time and place, and the printing of the optionally available listing and pupil roster, we can see that the workload is big and cumbersome, and it is very effortless to make mistakes [3]. What is greater serious is that the students’ direction determination is single, missing sure rationality, and it is hard to select the guides they like. The emergence of route choice machine has accelerated this situation, as a fundamental part of the facts machine in faculties and universities, the effectivity and basic overall performance of the route choice desktop are right away related to the effectivity of route selection, and then have an effect on the teaching of the financial savings machine in faculties [4].

Most schools and universities in China actively construct their very own college administration statistics device and make full use of the records campus network. A super online direction resolution administration gadget can now not solely make educating administration greater scientific, however additionally notably limit the workload of academic directors and thoroughly enhance the excellent of instructional management [5]. Building a modern, adaptable, and truthful path decision gadget can furnish direction determination statistics to instructing administration departments and instructors rapidly and conveniently. Teachers can intuitively see students’ route resolution via the system, and students’ year-end ratings can additionally be without problems entered [6]. The educating administration branch can well time summarize the students’ direction determination statistics and allocate the students’ category time. This has now not fully distinctly accelerated the workload of academic administrators, then again moreover delivered larger surroundings pleasant and reachable route desire choices for college students [7]. The informatization of direction decision administration displays the necessities of information-based teaching, and it is additionally the inevitable end result of the transformation of educating mode. The community path determination machine is the embodiment of the informatization stage of an institution, which is of notable importance for the modern college management [8]. In a realistic sense, the university students’ path decision device has realized the transparency and standardization of the direction determination process, shared the cutting-edge scattered educating information, now not solely elevated the pleasant of educating administration services, however additionally decreased the workload of the workforce engaged in academic administration.

With the fast improvement of laptop community technology, the development of digital campus in colleges and universities is in full swing. The community route decision machine no longer solely affords college students with an honest and life-like direction determination platform, however additionally drastically reduces the workload of tutorial personnel and improves work efficiency. This paper first analyses the overall performance troubles of the unique route choice system, and places ahead a multilevel overall performance optimization scheme to optimize and enhance the enterprise process, minimize the attention of facts processing for the duration of direction selection, and entire the database optimization and operation surroundings optimization. The strain takes a look at device used to be used for overall performance test, and the overall performance index used to be notably extended to meet the plan requirements. The direction resolution device meets the necessities of 5000 customers online at some stage in the path decision height period, the response velocity is decreased to much less than 5 seconds, and the software server runs stably, which properly meets the path decision necessities of complete universities.

The chapters and contents of this paper are organized as follows. Section 1 is the introduction, which introduces the historical past and magnitude of this study. Section 2 introduces the simple principle of random matrix. Section 3 analyses the mannequin of college physical education course selection based on random matrix theory, and offers the education go with the flow chart and education effects of the community model. Section 4 exams and runs the bodily schooling route resolution project. Section 5 incorporates out experimental evaluation and overall performance test. Section 6 summarizes the full textual content and places ahead prospects.

2. Related Work

The route decision machine has been used by way of nearly all faculties and universities to help in instructing management. At present, the administration feature of bodily training direction choice is additionally exceedingly perfect. Students can log in to the direction resolution device via the Internet to recognize nearly all features such as online direction selection, withdrawal and viewing direction decision information. Teachers can additionally log in to the path decision device thru the Internet to view the path resolution of their publications at any time and be prepared for teaching. Educational directors can view and control all the direction determination approaches thru a number of mouse clicks. The applicable lookup on the administration of bodily training path choice in colleges and universities the use of the random matrix concept is summarized as follows.

Relevant students have been dedicated to analysing and exploring the mode and workflow of academic administration in colleges and universities, and completed top results [9]. In Europe and the United States, the authorities attach extremely good significance to the improvement of records science in the subject of education, helps schools and universities to put into effect the community facts transformation of instructional administration management, and speeds up the building of auxiliary educating facilities [10, 11]. The community interconnection between colleges has realized online enrolment and data management. In order to clear up the hassle of route choice overall performance in university bodily education, the LoadRunner device is used to check the path decision performance. The bottleneck of path resolution overall performance is to show the listing of instructing classes, put up and affirm the path selection, and enter the menu of the instructional administration system. In order to damage thru the bottleneck, the
overall performance optimization scheme of direction determination is proposed, and the overall performance optimization is designed and implemented. After that, the path decision overall performance takes a look at is carried out again [12]. Before the course desire is formally used, it desires to be examined in the formal environment. Put beforehand the stress test plan of route willpower in the formal environment and analyse to take a look at results to achieve the envisioned goals.

Relevant pupils have analysed the traits of overseas academic administration direction choice system. Influenced by way of the academic environment, overseas universities or instructional establishments have outstanding flexibility and autonomy. For the school’s instructional administration work, the college can formulate instructional administration strategies in accordance to its very own necessities to facilitate the school’s administration of students’ publications and facilitate the awareness of the full technique informatization of students [13]. Computer community and different applied sciences have sprung up and developed in overseas international locations with greater developed economies. Accordingly, fact’s structure relevant to more than a few fields has developed rapidly, and instructional administration management records structures are no exception. The IT technicians in the school use optimal neighborhood technological information and computer technological information to make the machine very powerful, meet the wishes of educational administration management, and preserve immoderate information sharing and integration with special structures [14].

The data development of schools and universities is often based totally on the typical campus construction, the use of current facts science and capability to uniformly manipulate the scattered data resources, forming a digital space, so that the actual campus data assets can be prolonged and multiplied in time and space, so as to reap the motive of enhancing the degree and effectivity of schooling and instructing management [15]. The academic administration machine of every college has its very own characteristics, which are different. At this stage, the building intention of most schools and universities is to unify all types of scattered educating assets on the groundwork of normal campus community gadget with the aid of the use of superior improvement technology, construct a heterogeneous information sharing platform and the improvement of new structures on the foundation of the fact platform so as to meet the wants of current training and educating management.

3. Random Matrix Model and Basic Theory

Random matrix concept is one of the vital mathematical equipment for statistical evaluation of complicated systems. Through the statistical evaluation of the strength spectrum and eigenstates of the complicated system, it displays the conduct traits of the typical correlation in the real data. Random matrix is the hyperlink between high-dimensional statistical principle and realistic engineering problems. For engineering massive data, its spatial dimension \( N \) and time dimension \( T \) are frequently different [16]. Study the law of massive numbers and central restriction theorem of Wishart matrix and its linear eigenvalue facts LES that conform to such characteristics. Based on the above research, the prevent charge of LES is obtained a priori and the convergence rate of empirical spectral density of facts matrix is evaluated. They can be used as the comparative reference and comparison basis of experimental data, and are the entry thing to recognize data-driven object cognition.

According to the above definition, a typical Wishart matrix \( S = R^{T}RR^{T} \) can be constructed, where \( R \) is a standard Gaussian random matrix satisfying \( n \leq T \), and the probability density distribution of Wishart matrix is

\[
\rho_{\text{LUE}}(x) = \sum_{i=1}^{N} \frac{\prod_{i=1}^{N} (T - i)}{\exp[T_{r}(S)] \det S^{T-N} + \frac{1}{n} \sum_{i=1}^{n} I}. \tag{1}
\]

For the LUE matrix composed of \( \text{NXT} \) matrix, when \( n, t \) tends to infinity and \( c = N/T \), its spectral density function satisfies

\[
\lim_{N \rightarrow \infty} \rho(x) = \frac{\sqrt{(x - (1 - \sqrt{c})^{2})}}{2\pi} + \frac{\sqrt{(1 + \sqrt{c})^{2} - x}}{2cx}. \tag{2}
\]

Random matrix theory has two basic concepts: empirical spectral distribution function and limit spectral distribution function. For any \( n \times n \)-dimensional random matrix \( A \) with real eigenvalues, call the function.

The above formula is the empirical spectral distribution (ESD) of matrix \( A \), where \( \lambda_i^A \) is the characteristic root of matrix \( A \) and represents the indicative function. We name the restrict of empirical spectral distribution characteristic as the restrict spectral distribution function [17]. The empirical spectral distribution feature is random, however the restriction spectral distribution characteristic is typically nonrandom, such as round rate, semi-circular rate, Marchenko patter regulation, and round rate. For the \( M \) matrix of high-dimensional statistics source, the pattern covariance matrix is as follows:

\[
S_n = \frac{1}{n} \sum_{i=1}^{n} \mathbf{x}_i + \frac{1}{2cn} \mathbf{I} \tag{3}
\]

The empirical spectrum distribution function \( F_{\lambda}^{\text{ESD}}(x) \) can be obtained. By Stilettoes transformation, the find out about of the empirical spectrum distribution characteristic of random matrix can be modified into the learn about of the hint of the inverse of random matrix, and the restriction spectrum distribution feature can be obtained [18].

On the groundwork of the above theoretical analysis, mixed with the statistical evaluation method, a contrast mannequin for the administration effectivity of bodily training path resolution is established. Using the regular distribution model, an independent estimation mannequin for the administration effectivity contrast of bodily schooling direction determination is established [19]. The everyday distribution feature is described as follows:
In equation (4), \( \mu \) is the self-belief parameter of the assessment mannequin for the administration effectivity of bodily training path selection; \( \delta \) is the scale parameter; \( k \) is the getting to know parameter of the assessment of the administration effectivity of bodily training route selection. According to the statistical attribute quantity, the general everyday evaluation is carried out, and the self-belief distribution likelihood distribution feature of the comparison of the administration effectivity of bodily schooling path determination is obtained as follows:

\[
F(x) = \frac{\int_{-\infty}^{x} \exp \left(\frac{(x - \mu)^2}{2\sigma^2}\right) dx + \int_{-\infty}^{x} \exp \left(-\frac{(x - \mu)^2}{2k^2}\right) \frac{\Gamma(k)}{k} dx}{\int_{-\infty}^{\infty} \exp \left(-\frac{(x - \mu)^2}{2k^2}\right) \frac{\Gamma(k)}{k} dx}.
\]

(5)

According to the bad bias of the comparison of the administration effectivity of bodily schooling direction selection, the likelihood distribution characteristic of the reliability distribution of the assessment of the administration effectivity of bodily training path choice is received via the usage of the technique of binary parameter evaluation as follows:

\[
F_L(x) = \frac{\int_{-\infty}^{x} \exp \left[-\lambda \left(\frac{x}{\delta} - \mu\right)\right] dx}{\int_{-\infty}^{\infty} \exp \left[-\lambda \left(\frac{x}{\delta} - \mu\right)\right] dx} + \int_{-\infty}^{x} \exp \left(-\lambda \left(\frac{x}{\delta} - \mu\right)\right) dx.
\]

(6)

Combined with statistical decision-making and fuzzy decision-making methods, the generalized excessive fee distribution characteristic for the contrast of PE route resolution administration effectivity is obtained as follows:

\[
F_G(x) = \frac{\int_{0}^{x} \exp \left\{1 + k/\delta (x - \mu)^{1/k}\right\} dx}{\left(x^2 - \mu^2\right)^{1/k} \int_{-\infty}^{x} \exp \left(-\lambda \left(\frac{x}{\delta} - \mu\right)\right) dx}.
\]

(7)

The gamma probability distribution function is as follows:

\[
F_G(x) = \frac{\int_{-\infty}^{x} (x - \mu)^{k-1} \exp \left[-\lambda \left(\frac{x}{\delta} - \mu\right)\right] \frac{\Gamma(k)}{\Gamma(k)} dx}{\int_{-\infty}^{\infty} (x - \mu)^{k-1} \exp \left[-\lambda \left(\frac{x}{\delta} - \mu\right)\right] \frac{\Gamma(k)}{\Gamma(k)} dx}.
\]

(8)

According to the above distribution feature shape for the contrast of the administration effectivity of bodily schooling direction selection, the following complete check components for the administration impact of bodily schooling path choice are fashioned via the use of the traits of goodness of match check method [20].

The emphasis of static steadiness state of affairs is evaluated by means of the usage of random matrix theory, and the static steadiness margin is evaluated in accordance to the alternate regulation of restriction spectrum distribution function. In the following, two restrict spectral distribution functions, M-P charge and ring rate, are introduced. M-P price is used to have a look at the spectral distribution. The restriction spectral density of M-P charge is proven in system.

\[
f_c(\lambda) = \frac{\sqrt{b^2 - 4ac}}{2\pi^2} + \frac{\sqrt{(b - \lambda)(\lambda - a)}}{cx}.
\]

(9)

where \( c \) is the ratio of dimension to sample size and \( a \) is the scale parameter, \( \sigma^2 = 1 \). After preprocessing the input data of continuous power flow, the sample covariance spectrum distribution histogram and M-P rate curve can be seen by using the real-time separation window technology and selecting different states [21].

4. Test and Operation of Physical Education Course Selection Management

4.1. Physical Education Course Selection Management Test.

The instructing direction administration machine venture is carried out with the aid of the take a look at at team of the mission alone. The total software program checking out work is divided into 4 stages: check planning, take a look at plan and development, check execution, and check evaluation.

(1) When the assignment necessities are essentially determined, the take a look at at group and the evaluation and diagram crew will mutually talk about and formulate the take a look at at plan. Making a take a look at at format is to analyse the necessities of the device for trying out via examing the necessities of the system. The check format has to be divided into three levels: unit test, integration take a look at, and gadget test [22].

(2) Test graph and improvement is to graph the shape of unit take a look at at standards, integration check instances and device check instances in accordance to the examined characteristics, and decide the execution mode, enter and predicted output of every take a look at at case.

(3) Test execution is to enforce the check instances to be performed and file the take a look at at effects and issues in accordance to the effects of take a look at at diagram and development [23].

(4) After the check is completed, the check group wishes to summarize and consider the test, put together the inner device take a look at at record and post it to the educating direction determination management department.

According to the necessities of the assignment gadget for excessive stability, excessive overall performance and excessive security, the check of the mission will be organized as follows: characteristic test, boundary test, overall performance test, exterior interface test, human-computer interface test, electricity test, redundancy test, reliability test, protection check, and healing test [24].
4.2. Optimization of Course Selection Management Module.
In the path decision management, the route determination batch can be installed for one-of-a-kind pupil degrees and direction ranges, and the route determination begin and stop time, route determination strategy, etc. can be set to flexibly arrange path choice activities, such as keeping prohibited students, controlling the objects taking part in direction selection, and limiting the wide variety of guides and credits [25].

In phrases of design, it optimizes and improves the commercial enterprise process, lowering the awareness of facts processing when deciding on courses. On the basis of the popular method of path selection, modules are added: prechoice of required courses, introduction of students’ route decision results, my desired route settings, and my favored route choice [26]. Compared with the typical method, the range of guides chosen via college students is decreased via about 60% after direction resolution diversion, which is conducive to enhancing the overall performance of route selection [27, 28].

Students’ direction decision is divided into more than one direction resolution time periods. The route choice mode consists of path decision screening or time priority [29]. Generally, the first direction resolution stage adopts the screening mode, and the administrator of the Academic Affairs Office selects the courses to figure out whether or not or now not the students’ course desire is successful. Students have the equal risk of success at any time, college students do no longer have to rush for classes, and the time for deciding on guidelines is scattered, which is conducive to bettering the standard overall performance of deciding on classes. In the 2d direction determination stage, the time first mode is adopted, in which college students pick out first, get first, and fill up [30, 31]. On the foundation of the common approach of direction selection, the wide variety manage of module route determination and route determination screening are added, and the stage and date manage of module path resolution are modified. After including modules for route selection, the processing ratio of route decision records of every module is proven in Figure 1.

5. Experiment and Analysis
5.1. Performance Test of Course Selection Management.
After the optimization of the community shape of the instructing path resolution administration system, the overall performance degree of the device has to be considerably expanded in theory. Due to the massive quantity of modules of the instructing direction choice management system, it is constrained to the area problem. This area generally exams the scholar route resolution module of the optimized system. Namely: whether or not it can operate usually below sure load, response time, and response speed; Whether the machine can function usually after long-time operation. Find out and tune the universal overall

![Figure 1: Course selection data processing of each module.](image-url)
performance bottleneck of the platform, and unravel the normal overall performance troubles of the platform, such as memory overflow and gradual tempo. In this stress test, via constructing a stress check surroundings with the equal statistics scale as the actual environment, the usage of the industry’s mature automatic overall performance check tools, with the aid of growing stress check techniques and constructing stress check models, the automatic stress takes a look at used to be carried out on the examined system, and eventually the stress check end result evaluation used to be formed. 4000 online humans log in to the device from the single factor login to query, and the new release instance of route choice is 1. Assembly factor setting: launch users solely after the distinct share of customers walking in the situation reaches 20%. The check outcomes are proven in Figure 2.

In the face of huge direction choice facts processing, direction decision paralysis happens from time to time, affecting the faculty instructing order. In order to stop such matters from happening, it is integral to use the LoadRunner device for overall performance checking out earlier than the formal use of the software. Gradually make bigger the wide variety of simulated users, study the overall performance warning signs of the direction resolution gadget below exceptional loads, grasp the balance of the software program in detail, discover out the overall performance bottlenecks, reminiscence leaks and different issues of the device faster, optimize the server and the program, so as to enhance the software program to meet higher demands of customers and lay a basis for the clean improvement of the direction choice work. The database server aid utilization is proven in Figure 3.

From the above check results, the database server and Internet server have been in a steady state. When getting into the direction determination device from a single factor of login, the concurrency of route resolution can be stabilized at 20% when the range of online humans is 4000, which can essentially meet the relative balance of the gadget when so many humans are on-line. The greater the concurrency of online people, the greater the steadiness of the machine when so many human beings are on-line. The consequences of the stress check exhibit that the gadget is extraordinarily secure when the quantity of online human beings is about 4000 and the concurrency is about 20%. In addition, it is higher to log into the path decision device from the single factor login gadget than from the instructional administration system.

5.2. Analysis of Performance Index Results. Compare the authentic fee of overall performance warning signs with the predicted fee of overall performance measures proposed in the demand stage at some stage in the height length of direction selection, and the indications are multiplied to obtain the graph objectives. The real values of direction resolution overall performance indications are proven in Figure 4. The top time of route determination is 80%, and the common response time is shut to the common response time.

The number of hits per second and throughput is shown in Figure 5.

In the first three minutes, the maximum range of clicks per 2d reached 195. After 80% of the time, the quantity of clicks per 2d fluctuated around one hundred fifty. It is speculated that at the commencing of the path choice stage, the overall performance stress of the direction determination is the greatest, and after a length of time, the overall performance strain is relieved and tends to be stable. The variety
of clicks per 2d is constant with the throughput, which proves that the route decision gadget is going for walks well. If there are greater clicks per 2d and much less throughput, it proves that the direction determination gadget is overwhelmed.

5.3. Analysis of Evaluation Accuracy. The simulation experiment of teaching quality evaluation is realized through model analysis. The change of mean square error and prediction accuracy percentage based on random matrix model are shown in Figure 6.

Figure 6 indicates that the random matrix mannequin meets the cease circumstance in the era 60, that is, the wide variety of convergence steps is 60, indicating that the random matrix mannequin can speed up the convergence pace of the network. It can be viewed that amongst the 30 agencies of take a look at samples, the prediction accuracy proportion of 29 companies is more than 96%, and the prediction accuracy of 22 businesses is greater than 98%. It can be viewed that the random matrix mannequin has a suitable approximation effect.

The sum of error squares and fitness function curve based on the random matrix model are shown in Figure 7.

Figure 7 suggests that the convergence velocity of the sum of squares of blunders is quicker earlier than technology 5, and the convergence velocity of generations
10 to 30 is quite slow. After the variety of iterations is 34, the sum of squares of mistakes of the community reaches a steady level, indicating that the international optimization can be realized shortly primarily based on the random matrix model. The coaching health characteristic primarily based on the random matrix mannequin converges quicker earlier than technology 10, and essentially reaches a steady kingdom after forty-five iterations. It can be considered that the adaptability of the model is high. In a word, the inherent mechanism exceptionally based totally on the random matrix mannequin determines its teaching and prediction performance. Considering the prediction accuracy and adaptability, the educating pleasant comparison mannequin primarily based on the random matrix mannequin is high-quality and robust.

Figure 5: Changes in hits per second and throughput. (a) Change of hits per second. (b) Change of throughput.

Figure 6: Changes in hits per second and throughput. (a) Mean square error. (b) Percentage of prediction accuracy.
6. Conclusion

This paper generally researches the overall performance optimization of university bodily schooling route choice administration gadget primarily based on the complete path determination system. The complete path decision machine places ahead greater necessities for the overall performance of the direction choice system. The normal techniques of direction choice gadget have serious overall performance problems. In order to remedy this problem, the device has been optimized at a couple of tiers to optimize and enhance the enterprise processing process, decrease the awareness of information processing at some point of path selection, and play a great function in enhancing the device performance. Through the stress take a look at to affirm the optimization effect, the overall performance bottleneck in the machine is solved, the overall performance index in the height length of direction resolution is reached, 5000 customers are on-line, the present-day response pace is decreased to much less than 5 seconds, and the utility server runs stably. The software program of the course selection administration machine in quite a number of universities over the years suggests that the course dedication device meets the instructing requirements of the full financial savings system, can bear the stress of centralized route desire in entire universities, and meet the requirements of every attribute and performance.

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 Shanghai Lixin College of Finance and Accounting.

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