TELKOMNIKA, Vol. 11, No. 9, September 2013, pp. 5371~5377
ISSN: 2302-4046

Advantages of Computer Intelligent Simulation on Taijiquan Teaching

Meng Xue
Department of Basic Education, Henan Polytechnic, Zhengzhou 450046, Henan, China
e-mail: meng_xue2013@163.com

Abstract

This paper firstly analyzes the advantages of computer intelligent simulation teaching. On this basis it combines with the characteristics of Taijiquan teaching. Based on the analysis of mathematic model, it applies the advantages of computer intelligent simulation in Taijiquan Teaching to further deepen and construct optimized Taijiquan teaching model based on computer intelligent simulation. It enhances the systematicness and practicality of teaching system in the field of Taijiquan teaching, which plays a great promoting role on deepening the research of Taijiquan teaching to improve learners' technical level.

Keywords: *computer intelligent simulation, taijiquan teaching, potential components, impact function, time series*

1. Introduction

The progress of computer simulation is closely and inseparable related to the rapid development of information technology. In the Second World War, in order to simulate the whole process of nuclear explosion, people apply Monte Carlo method to do simulation experiment by using twelve shot models. With the development of economy and technology, the computer simulation has been further applied in various aspects research, and provides supplement for multidisciplinary research [1, 2]. People have been increasingly aware of the importance of computer simulation, and ultimately it is known as a separate subject to be widely explored. Information technology education in foreign countries starts very early, the information technology is applied in the field of education teaching by using different forms. In Britain, primary and secondary schools mainly adopts government planning, social organization′s widely participating and support, education departments and school specific implementation measures to develop computer and information technology education. In China, the information technology used in the field of education starts late. By far, it has gone through 1980s experiment stage. The development stage of 1990s is entering the basic popularization stage. Modern educational technology with computer multimedia network technology as the core has an unprecedented development. The field of educational teaching obtains high-tech support. It provides vast development space and research platform for the existence and development of information technology applied in the field of teaching [3].

2. Analysis of Computer Intelligent Simulation Teaching Advantages

2.1. The Connotation of Computer Intelligent Simulation

Computer simulation is also known as the computer intelligent simulation. It refers to use computer information technology to assume a building model aiming at the practical problems in reality [4]. It is closely related to real life, and provides new help and technical method for human research of behavior characteristics and law changes of a project [5].

Computer intelligent simulation model is a systemic simulation behaviour. Through the combination of the multimedia technology of the computer, communication and information technology, logical judgment, it really performs some specific phenomenon by computer, such as humanity, nature, architecture, art, behaviour and so on. Generally speaking, from beginning to end, computer intelligent simulation needs to go through nine steps [6]. It is as shown in Figure 1.

Received March 18, 2013; Revised June 13, 2013; Accepted June 24, 2013

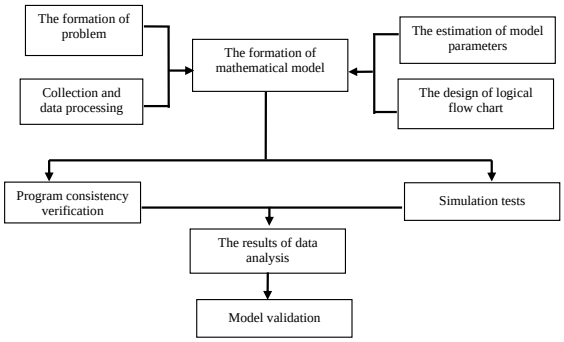

Figure 1. Computer Intelligent Simulation Process

In Figure 1, it shows that before computer intelligent simulation, it needs to make clear the specific target of this simulation. For the required data with a maximum of collection and processing, it can form a solid foundation of mathematical model. In the formed mathematical model, it needs to consider the interaction among the various parameters. It estimates the parameter of model to determine the initial state of parameters, so as to design the logical flow chart of the whole simulation process. It aims at the flow chart design program to achieve intelligent simulation. Based on the reality, it verifies the consistency of the program and present status. When the consistency strength reaches optimization, it does intelligent simulation test [7]. It analyzes all the data to perfect the simulation. Finally, it makes model validation to complete the whole intelligent simulation.

2.2. Analysis of Teaching Advantages

As one of the main components of modern education environment construction, computer simulation provides a comprehensive operation model to the students, trains students in all aspects of technology and develops students' potential ability. Finally, it achieves the purpose of scientific teaching and edutainment.

.In order to improve the teaching level, computer intelligent simulation teaching uses computer simulation to stimulate students learning motivation. It combines computer graphics, image, sound to become a virtual reality model, at the same time it fuses with the real world to achieve interactive teaching terminal with most realistic and experience [8, 9]. On the condition of improving students' learning interest and stimulating students' active learning motivation, it is more outstanding the knowledge points of teaching, which provides a reliable way for students to efficiently master knowledge.

3. The Advantages of Taijiquan Teaching Applying Computer Intelligent Simulation

3.1. Analysis of the characteristics of Taijiquan teaching

Chinese WuShu is traditional, competitive and culture. And the martial art philosophy of Chinese WuShu has a sharp contrast with Western idea of advocating strength and speed competitive sports. Taijiquan is seeking for the weak overcoming the strong and the static subduing dynamic. The decision of winner is not relying on physical strength to beat opponent, but conquering the opponent with kindness from inner [10, 11]. Taijiquan teaching mainly emphasizes on dynamic teaching. It is a dynamic process that in the learning process, it completes the comprehensive coordination of ideation, breathing, body and other aspects. The specific requirements are as shown in Figure 2.

In Figure 2, it shows that Taijiquan teaching emphasizes the dynamic process. In the process of teaching, due to the human teaching is along with personal emotional reasons, so that different personal teaching exist differences [12]. At the same time, there is much difference in the process of teaching how to stimulate students' learning interest, enhance students' Taijiquan skills analysis, and be better learning. Taijiquan teaching methods need to pay attention to good intelligence, inheritance, reproducibility and interactivity, which has become a new teaching mode for teachers.

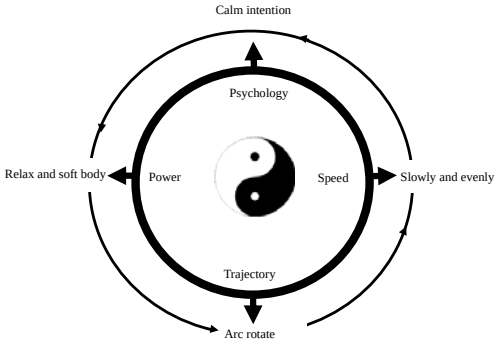

Figure 2. Characteristics of Taijiquan Teaching

3.2. Analysis of Teaching Advantages

Taijiquan teaching applied in computer intelligent simulation produces traditional Wushu teaching mode and a new model of modern Wushu teaching. Essentially, it promotes the transformation of sports teaching mode, updates teaching ideas, and improves teaching efficiency [13].

The use of information technology to summarize the theoretical knowledge of Taijiquan and integrate multi-disciplinary knowledge, according to the Taijiquan's boxing type, footwork, azimuth transform, motion path, etc, it forms the computer intelligent simulation of Taijiquan teaching by in accordance with the group characteristics. Assuming the function $S = f(yc, r, v, mc)$ of Taijiquan teaching computer intelligent simulation is a single teaching response set within unbounded free space. Taijiquan teaching computer intelligent simulating a single teaching response set within unbounded free space satisfies the following equation: $G = \sum S_i = \sum f(yc, r_i, v_i, mc_i)$ .In unbounded free space, computer simulation is normalized, so as to the whole simulation consists to Taijiquan practice routine [14]. It is set as $(i = 1, 2, 3, \cdots\cdots N)$, so:

$$S_t = f_1(S_{t-1}, \sum f_2(r_i, v_i, mc_i)) = f_3(S_{t-1}, O_1, O_2, O_3, \cdots O_N), \qquad (i = 1, 2, 3, \cdots\cdots N) \tag{1}$$

In order to expand the learning guidance experience scope of teaching field, it opens up a new way of computer simulation in teaching practice to save students curriculum practice expenses, guarantee students class practice safety, and be more convenient and efficient to complete the course teaching task, etc. Through computer simulation teaching, teachers can tend to zero and the simulation teaching density S_t can tend to S_{t-1}, so $S_t = S_{t-1} + \sum H_i$ .The simulation density $(i = 1, 2, 3, \cdots\cdots N)$ is Dirac impact function. Hi is the impact point of entire computer simulation teaching. $C(r, z) = \begin{cases} C_{\max} * erfc \left\{ \dfrac{[r - \rho(z)]}{[4\sigma(z)]^{1/2}} \right\} r \geq \rho(z) \\ C_{\max} * erfc \left\{ \dfrac{[\rho(z) - r]}{[4\sigma(z)]^{1/2}} \right\} r < \rho(z) \end{cases}$ is the function value of unbounded free space $D(r, z, \Delta t) = \dfrac{C(r, z)}{\left[1 + a * e^{-k\Delta t * C(r, z)}\right]}$.

$$D(r, z, \Delta t) \tag{2}$$

In formula (2), it shows in the application of computer simulation teaching, Taijiquan teaching can introduce virtual classroom, which greatly enriches the students' learning experience, and constructs a virtual world model without time and space limit, saving material

and financial resources. In unbounded free space, the formula (2) of computer intelligent simulation function Δt trends to collapse state, it will face the three-dimensional field, so:

$$H = mc \times D(r, z, \Delta t) \tag{3}$$

But the use of virtual classroom can broaden students′ horizons, diverge students′ thinking, mobilize and inspire students advanced thinking in their simulating study and practice process, which can effectively improve the reasoning and critical thinking of students. It has reciprocity [15].

$$H_i = mc_i \times D(r_i, z_i, \Delta t) \tag{4}$$

For the bounded teaching space, the effect of Taijiquan teaching simulated by computer intelligent can have more prominent and special Taijiquan theory knowledge and professional judgment reasoning than the general computer system. It has stronger pertinence decision advisory capacity. It has a comprehensive knowledge and speed knowledge processing skills than human Taichi coach teacher. It is without the limitation of time, space and human feelings, so:

$$(i = 1, 2, 3, \cdots\cdots N) \tag{5}$$

Based on computer intelligent simulation, Taijiquan teaching can be more capable to judge learners′ learning quality and extent through Taijiquan's spectrum image. So Taijiquan teaching has been more operability, stronger target. At this time, G_1 can be get with the help of G_0, as long as:

$$G_1 = G_0 + G' \tag{6}$$

In formula (6), it shows that Taijiquan enthusiasts′ learning and teacher's teaching in accordance with students′ aptitude to tap the potential of students can be better teaching and learning Taijiquan.

The Green function G_2 satisfies:

$$\begin{cases} -\nabla^2 G_2 = \delta \\ \left.\dfrac{\partial G_2}{\partial n}\right|_{\Gamma} = 0 \end{cases} \tag{7}$$

In formula (7), due to the value of $\left.\frac{\partial G_2}{\partial n}\right|_{\Gamma}$ can be 0, it inevitably requires personal teaching factor is zero in the field Ω defined by boundary Γ, so as to solve various factors′ limit, and thee disadvantages of scattered, individual, local research and technology experience, which strengthens the whole teaching field′s integrity, systematicness, comprehensiveness and operability and contingency.

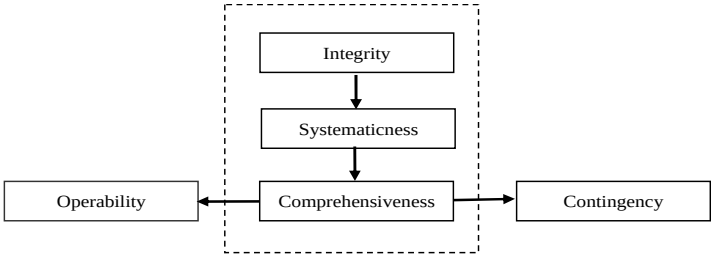

Figure 3. Taijiquan Teaching Applying the Performance of Computer Intelligent Simulation

Taijiquan teaching applying computer intelligent simulation in Figure 3 is a modern teaching means, which can effectively promote the Taijiquan teaching mode be modernized, also overcome the shortcoming of the traditional Taijiquan teaching, increase the attractiveness of Taijiquan teaching, and improve teaching quality. The application of computer simulation in teaching has obvious advantages, so the study of computer simulation can be inferred to have broad market prospects. It leads the main trend of the development of modern educational technology.

3.3. The Establishment and Analysis on the Model

This paper uses proliferation in the dynamics model to construct the popularization model of Taichi culture. Among them, we used dynamics model in the time and space, namely cellular automatta (brief name CA) building the coupling model. And the basic thought of the popularization dynamics of cellular automatta is as follows:

All objects $S = f(yc, r, v, mc)$, The cumulative amount of value G for popularization:

$$G = \sum S_i = \sum f(yc, r_i, v_i, mc_i) \quad , (i = 1, 2, 3, \cdots\cdots N) \tag{8}$$

In which,

$$S_t = f_1(S_{t-1}, \sum f_2(r_i, v_i, mc_i)) = f_3(S_{t-1}, O_1, O_2, O_3, \cdots O_N) \ (i = 1, 2, 3, \cdots\cdots N) \tag{9}$$

S_t for the popularization of the source state, S_{t-1} for the popularization of the source, the last state. That is:

$S_t = S_{t-1} + \sum H_i$, $(i = 1, 2, 3, \cdots\cdots N)$, Hi for the state corresponding to the instantaneous value.

$$C(r,z) = \begin{cases} C_{\max} * erfc \left\{ \dfrac{[r - \rho(z)]}{[4\sigma(z)]^{1/2}} \right\} r \geq \rho(z) \\ C_{\max} * erfc \left\{ \dfrac{[\rho(z) - r]}{[4\sigma(z)]^{1/2}} \right\} r < \rho(z) \end{cases} \tag{10}$$

$$D(r, z, \Delta t) = \frac{C(r,z)}{\left[1 + a * e^{-k\Delta t * C(r,z)}\right]} \tag{11}$$

C (r, t) is said to expand the dissemination of the saturation value, $D(r, z, \Delta t)$ for instantaneous value, wherein, Δt for the time difference. The Taichi Culture Popularization coefficient function:

$$H = mc \times D(r, z, \Delta t) \tag{12}$$

$$H_i = mc_i \times D(r_i, z_i, \Delta t) \ , (i = 1, 2, 3, \cdots\cdots N) \tag{13}$$

4. Construction and Optimization of Taijiquan Teaching Model of Computer Intelligent Simulation

Taijiquan is the essence of Chinese WuShu. It is known as "the quintessence of Chinese culture". In recent years, with the popularization of radio, film, television and the network information technology, Chinese WuShu is expanded to the international, known and loved by many national sports, Wushu lovers. And Taijiquan as the essence of Chinese WuShu is rendered and deified. It is highly regarded in the international WuShu. How to do a good job of teaching Taijiquan is the current problem to be solved in the field of scholars and front-line

teachers. In Taijiquan teaching, the application of computer simulation technology is a new means in current education teaching. In the computer world computer intelligent simulation teaching, the whole computer intelligent simulation effectiveness level can be divided into three levels. The specific is as shown in Figure 4.

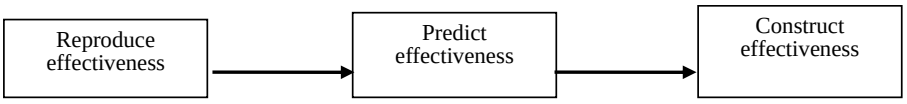

Figure 4. Computer Intelligent Simulation Effectiveness Level

In Figure 4, it shows that reproduction is to realize the authenticity of the whole computer intelligent simulation. Prediction is to realize the future consistent of the whole computer intelligent simulation. Construction is to perform the internal structure of the whole computer simulation. At the same time, the computer intelligent simulation system has some randomness. It generally needs to use statistical or time sequence mathematical model to analyze the whole system. According to the advantages analysis of computer intelligent simulation in Taijiquan teaching, assuming Taijiquan teaching computer intelligent simulation function G is a single teaching response set within unbounded free space. And among them, it is $v = G_0 = \frac{1}{4\pi r}$. G_0 meets $-\nabla^2 G_0 = \delta(M, M_0)$. The whole computer simulation teaching impact point M_0 is outside of the unbounded free space. Then:

$$\iiint_{\Omega} \left(u\nabla^2 G_0 - G_0 \nabla^2 u\right) d\Omega = \iint_{\Gamma} \left(u\frac{\partial G_0}{\partial n} - G_0 \frac{\partial u}{\partial n}\right) d\Gamma \tag{14}$$

Computer simulation has the characteristics of adjustable time dimension, which makes the environment state change speed adapt to the student learning experience speed. At the same time, it filters most unnecessary interference details. It is $-\nabla^2 u = \underline{\rho}$, so it can get:

$$\iiint_{\Omega} -u\delta d\Omega + \iiint_{\Omega} G_0 \underline{\rho} d\Omega = \iint_{\Gamma} u\frac{\partial G_0}{\partial n} d\Gamma - \iint_{\Gamma} G_0 \frac{\partial u}{\partial n} d\Gamma \tag{15}$$

In formula (9), it ensures the maximized effective learning time of students, and deepens students understanding and impression of knowledge. In teaching practice, the application of computer simulation software wins precious time for the students more inside and outside class discussion. As the impact function δ of time unrestricted, the screening potential formula is:

$$u(M_0) = \iiint_{\Omega} G_0 \underline{\rho} d\Omega + \iint_{\Gamma} G_0 \frac{\partial u}{\partial n} d\Gamma - \iint_{\Gamma} u\frac{\partial G_0}{\partial n} d\Gamma \tag{16}$$

In formula (10), for the practice activities of hazardous or more expensive experimental equipment, computer simulation software is not restricted by time and space, which provides a complete set of experience conditions for students. In guarantee students' safety learning and experience, it saves practice expense. Namely, in the teaching environment, the potential $u(M_0)$ of M_0 can be composed of three elements. It is formed by the potential component of ρ, $\frac{\partial u}{\partial n}\Big|_{\Gamma}$ and $u\big|_{\Gamma}$ respectively produced to stack. If G_0 is replaced by G_1 and considering $G_1\big|_{\Gamma} = 0$, then the application of computer simulation software in teaching practice is not only in classroom teaching. In the modern education, it has developed remote teaching, self learning and a series of excellent same type software with development value. At the same time, as a

new WuShu teaching mode, it has become a new mode of Taijiquan teaching. It is the inevitable trend of the future Taijiquan teaching and a important method to improve teaching quality.

5. Conclusion

Computer intelligent simulation of Taijiquan teaching was bidirectional. It presented the integration relationship between the two. In the Taijiquan teaching, it applied computer simulation technology to develop students' thinking ability, and stimulate learning interest. Teaching work should be combined with the teaching actual process, to analyze teaching characteristics of computer intelligent simulation technology. Through the pros and cons analysis of computer intelligent simulation in Taijiquan teaching, it established information teaching model. Starting from the multiple development state, it explored a new path for the Taijiquan teaching.

References

[1] J Shi, Y Zhang, H Bi. Fluence of general self-efficacy as a mediator in Taiji-induced stress reduction-Results from a randomized controlled trial. *European Journal of Integrative Medicine*. 2013; 3(1): 270-280.
[2] C Lan, J Lai, M Wong. Cardio respiratory function, flexibility, and body composition among geriatric Tai Chi Chuan practitioners. *Archives of Physical Medicine and Rehabilitation*. 2010; 77(6): 612-616.
[3] G Li, B Zhang, S Li, W Fang, R Sun. The Study of Crew Physical and Psychological Evaluation Model and Sports Intervention Method. *IJACT*. 2013; 5(1): 20-28.
[4] Peter M Wayne, Brad Manor, Vera Novak. A systems biology approach to studying Tai Chi, physiological complexity and healthy aging: Design and rationale of a pragmatic randomized controlled trial. *Contemporary Clinical Trials*. 2013; (34)1: 21-34.
[5] Douglas P Kiel, David E Krebs, Roger B Davis. The Effects of Tai Chi on Bone Mineral Density in Postmenopausal Women: A Systematic Review. *Archives of Physical Medicine and Rehabilitation*. 2007; 88(5): 673-680.
[6] J Qu, J Yang, H Liu, Renbiao Wu. Clock Synchronization in Air Traffic Control System Using NTP, *JDCTA*. 2013; 7(1): 344-351.
[7] K Chen, W Chen, M Huang. Development of the simplified Tai Chi exercise program (STEP) for frail older adults. *Complementary Therapies in Medicine*. 2006; 14(3): 200-206.
[8] W Lu, C Kuo. Effect of 3-Month Tai Chi Chuan on Heart Rate Variability, Blood Lipid and Cytokine Profiles in Middle-Aged and Elderly Individuals. *International Journal of Gerontology*. 2012; 6(4): 267-272.
[9] J Cui, Z Lai, X Zhang. Cryptanalysis and Improvement of A Remote User Authentication Scheme Based on Dynamic ID Using Smart Card. *JDCTA*. 2013; 7(1): 828 – 837.
[10] Peter M Wayne, David E Krebs, Steven L Wolf. Can Tai Chi improve vestibulopathic postural control?. *Archives of Physical Medicine and Rehabilitation*. 2005; 85(1): 142-152.
[11] Z Yue. Three dimensional analysis of the snatch technique for two world record creators at the 6th national athletic meeting of PRC. *Journal of Biomechanics*. 2005; 22(10): 1109-1120.
[12] G Song. Computer Network Security and Precaution Evaluation based on Incremental Relevance Vector Machine Algorithm and ACO. *AISS*. 2013; 5(1): 120 -127.
[13] Z Liu, T Liu. Biomechanical analysis of backward giant full twisting to handstand on parallel bars for two world champions. *Journal of Biomechanics*. 2005; 20(11): 1220-1228.
[14] J Wang, Z Chen, Y Song. Falls in aged people of the Chinese mainland: Epidemiology, risk factors and clinical strategies. *Ageing Research Reviews*. 2010; 9(1): S13-S17.
[15] Jasmine C Kwok, Christina W Hui-Chan, William W Tsang. Effects of Aging and Tai Chi on Finger-Pointing Toward Stationary and Moving Visual Targets. *Archives of Physical Medicine and Rehabilitation*. 2010; 91(1): 149-155.