Analysis of Marginal Effect of Ability Improvement Based on Simulated Training Equipment

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ABSTRACT
Simulation training is a key training method to improve equipment operators. However, the marginal effect of this training method is obvious. When the training reaches a certain degree, continuing training will lead to serious marginal effect, resulting in increased training time and little ability improvement. Therefore, it is an urgent problem to study the marginal effect of simulation training. Through the marginal effect analysis, this paper gives the marginal effect parameters of simulation training and defines the boundary of simulation training, so as to solve the training funds and improve the training effect.

Keywords: *Simulation Training, Capability Improvement, Marginal Effect*

1. INTRODUCTION

Training is not only an important way to improve and maintain operation ability, but also an important means to maintain high proficiency. With the development of science and technology, the performance of world equipment is improving day by day [1-2]. Simulation training has become the focus of attention and pursuit in the industry because of its characteristics of saving funds, repeatability, traceability, less constraints and high safety factor. It has an important position and role, which can significantly improve the training effect and reduce the training funds [3-5].

With the help of computer technology, simulation training can imitate close to the actual operation environment, so that operators can simulate various training courses in front of the computer and carry out training similar to the actual operation environment, so as to save a lot of money and shorten a lot of training preparation time [6-8]. On the other hand, simulation training can present a close to the actual operating environment with the help of computer related technology, reduce the training cost, greatly reduce the risk brought by training, improve the training safety and improve the training efficiency on the premise of ensuring the training safety. Therefore, in order to obtain good operation ability, maintain operation proficiency and save training funds, simulation training is an important training means [9-12].

Because there is a gap between the hand feeling, vision, authenticity and real training of simulation training, when the simulation training reaches a certain stage, it will lead to the investment of training amount and cannot bring effective ability improvement. At this time, physical training is needed to further improve the training effect. However, physical training will bring a series of problems, such as consuming a lot of training funds, consuming the service life of equipment, reducing the technical performance of equipment and so on [13-14]. At this stage, the main processing method is to simulate training as much as possible. Only when the simulation training cannot meet the requirements, the physical training will be adopted. This qualitative treatment is not scientific enough and will consume valuable students' learning and training time. In order to solve this problem, this paper studies this problem [15-17].

2. MARGINAL EFFECT MODEL ANALYSIS

Marginal effect refers to a phenomenon that when other inputs remain unchanged, a certain input is continuously increased, and the increased output and benefits remain unchanged or decrease. When the simulation training reaches a certain stage, there will be obvious marginal effect, that is, increasing the duration and amount of simulation training cannot achieve the improvement of effective operation ability and operation proficiency, resulting in the stagnation of training at a low level and difficult to obtain the due training effect. Therefore, it is necessary to study and determine the simulation training based on marginal effect, which is of great significance to support the switching time of physical training.

2.1. Simulation Training Process Based on Marginal Effect

In order to maximize the improvement of training ability within the scope of ability improvement with minimum time and fund investment, a simulated training process based on marginal effect is designed, as shown in the figure 1 below.

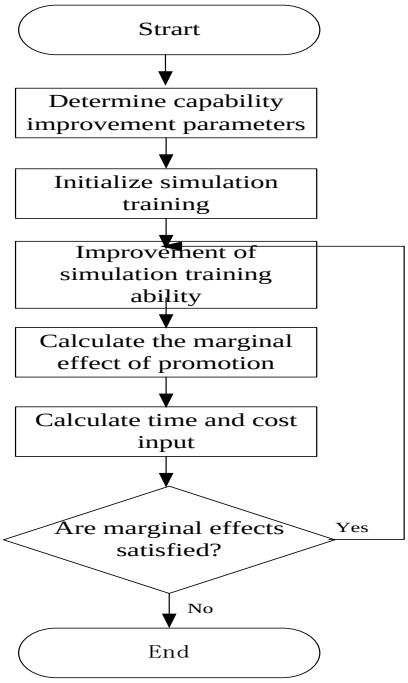

Figure 1. Flow chart of simulation training ability improvement

2.2. Calculation of Marginal Effect Based on Rough Set

Rough set is an intelligent information processing method to study the expression, learning and induction of incomplete data and imprecise knowledge. It is also an effective analysis tool in the field of data mining. The characteristic of this method is that it does not need any prior knowledge. But directly from the given data set, through data reduction, establish decision rules, so as to find the implicit knowledge in the given data set.

3. MARGINAL EFFECT EVALUATION PROCESS BASED ON ROUGH SET

In the calculation of marginal effect, the most important thing is whether the marginal effect meets the conditions. When the marginal effect meets the known parameter conditions, the shooter's operation ability can be increased by continuing to invest in simulation training times. When the marginal effect does not meet the known parameter conditions, it is stated that the input of simulation training cannot bring effective output. At this time, the simulation training needs to be ended, Switch to live fire training. The marginal effect evaluation steps based on rough set are shown in the figure 2.

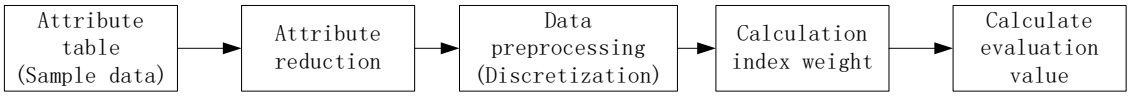

Figure 2. Marginal effect evaluation process based on Rough Set

4. CONSTRUCTION OF OPERATIONAL CAPABILITY EVALUATION MODEL

Analytic hierarchy process is a method to analyze and determine the overall capability weight by comparing the importance of different factors by experts. This method can replace the scoring of capability importance by comparing the importance of influencing tank operation capability, and reduce the uncertainty of subjective scoring by experts.

4.1. Principles of Model Construction

In order to effectively support the evaluation of tank operation capability, the following principles are followed in the process of building the model:

(1) Integrity: the adopted capabilities must be related to the tank operation capability evaluation and have practical significance in the actual operation process. The opinions of experts can be participated in the construction process, but the sum of all capabilities cannot lack key items, and the ratings of experts on capabilities are ignored;

(2) Adaptability: the adopted capabilities must support each other, and there can be no opposing capabilities. These indicators interact and jointly support the evaluation of tank operation capability;

(3) Quantifiable: the adopted capability must be quantifiable and can be characterized by data. In the actual operation process, it should be avoided that the selection quantity is too large, resulting in the operation process becoming a NP problem. Generally, the selection of no more than 20 capabilities.

4.2. Construction of Analytic Hierarchy Process Model

Considering the characteristics of tank operation ability evaluation and referring to the construction

process of analytic hierarchy process, a hierarchical analytic hierarchy process model is constructed. The model adopts a three-tier structure and reduces the influence of expert subjective factors on the evaluation results through an objective method (see table 1).

Table 1. Evaluation Method of Analytic Hierarchy Process Model

Decision-making level	Middle layer	Factor layer
Operational capability assessment A_1	Operation accuracy B_1	C_1
		C_2
		C_3
		C_4
		C_5
		C_6
		C_7
		C_8
		C_9
	Operating speed B_2	D_1
		D_2
	Correction capability B_3	E_1
		E_2
		E_3

4.3. Construction of Judgment Matrix

The overall model is decomposed into the comparison between factors, and the evaluation of influencing factors by experts is transformed into the comparison of the importance of factors. Therefore, each level is decomposed. Decompose the first layer

$$A_1 = \begin{bmatrix} B_{11} & B_{12} & B_{13} \\ B_{21} & B_{22} & B_{23} \\ B_{31} & B_{32} & B_{33} \end{bmatrix} \tag{1}$$

Decompose the second layer

$$B_1 = \begin{bmatrix} C_{11} & C_{12} & \cdots & C_{19} \\ C_{21} & C_{22} & \cdots & C_{29} \\ & \vdots & & \\ C_{91} & C_{91} & \cdots & C_{99} \end{bmatrix} \tag{2}$$

$$B_2 = \begin{bmatrix} D_{11} & D_{12} \\ D_{21} & D_{22} \end{bmatrix} \tag{3}$$

$$B_3 = \begin{bmatrix} E_{11} & E_{12} & E_{13} \\ E_{21} & E_{22} & E_{23} \\ E_{31} & E_{32} & E_{33} \end{bmatrix} \tag{4}$$

4.4. Calculate Respective Weights

The results given by experts are settled by simulation software.

The inherent parameters of marginal effect are determined by the 10 point scoring method, and the final score of each specific index value is distributed between 0-10:

$$a_i = \frac{\sum_{j=1}^{l} b_{ij}}{l} \tag{5}$$

Where, a_i is the evaluation value of the i index collectively considered by the expert group, b_{ij} is the evaluation value of the expert j on the index i, and l is the total number of experts participating in the consultation.

5. CONCLUSION

By studying the marginal effect in the improvement of simulation training ability, this paper puts forward the simulation training process under the influence of marginal effect, constructs the marginal effect evaluation process based on rough set, and constructs the operation ability evaluation model, which provides theoretical support for the improvement of operation ability and the saving of training time and cost, The quantitative research of the model is the next research direction.

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