

The Application of Study Assessment Based on Cloud Model in Educational System

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Abstract—In this paper, it studied student study quality assessment system in the educational system combined with cloud theory. In order to do better reflects on the teaching thinking of the center of students and improve teaching effect and learning quality, it construct a new method for the quality of student study quality assessment model based on cloud model. The paper has proven the fact that the new method is effective and operable. The application of the cloud model in the personalized intelligent tutoring has laid a good foundation for the further study that.

Keywords— educational system; cloud model; study quality assessment

1. Introduction

The current education system is mostly based on "the center of students", it is Multi-disciplinary adaptive education system, and it is good flexibility and strong independent, It involves many fields' related technology, such as artificial intelligence, computer science, education, psychology, behavioral science and so on, It is one of the important research directions in educational technology domain, And applied in mathematics, physics, engineering, chemistry, and military training and also many other fields. The main features of the system is the teaching thinking of the center of students, students are no longer limited to the fixed educational model, it mets the needs of diverse forms of teaching, that has stimulated student's enthusiasm and the initiative, and improved teaching effect and learning quality.

Evaluation of the quality of students' learning is a very important part of in education system, the reasonable evaluation system may find out student's study situation accurately, and gives personalized teaching instruction opinion, and help students successfully complete teaching objectives, makes that the teaching System has really played the role in teaching. At present, the way of the evaluation of the traditional students' learning is divided by the results of evaluation subjects, according to certain rule formulation proportion, and then realizes students the different scale hard division. Following as this evaluation exist some of the common problems [2]:

(1)The weight of evaluation factors is often draws up directly by the minority expert according to the experience, the subjectivity is quite strong.

(2) Evaluating indicator's quantification is lack of the scientific theory basis; majority is determined by the empirical value or the simple arithmetic mean value.

(3) The form of expression of the results of evaluating is single, evaluated students is not elaborate indicators in the evaluation of specific performance conditions, with no specific improvement suggestion.

Quality Assessment of Student Learning is a multi-level, multi-target complex issue; the evaluation involves many kinds of factors, it is difficult to accurately and completely describe them with simple traditional mathematical model. Therefore it needs one new assessment method to improve the inadequate of the existing assessment method. In recent years, the cloud model is proposed to be the exchange of qualitative

and quantitative model based on the traditional fuzzy mathematics and probability and statistics, mainly used to reflect the concept uncertainty in the natural language. At the same time, the cloud model combines the fuzziness and randomness together organically unifies, has realized uncertainty transforms between the qualitative linguistic value and the quota value [3].

Based on the above characteristics, the paper attempts to introduce cloud theory, and the cloud model applied in the Quality Assessment of Student Learning, In view of the personalization educational model, carry on the analysis, the research, then carries on the rank division to student's academic record to the average tests of the student, It is advantageous for student to choose more suitable plan for their own study according to their level [4]. This article design related experiment in the end, experimental results show that it could be effectively carried out on soft division, which cloud model will be applied to the qualitative evaluation of learning quality, The result of relevant evaluation can reflect not only students' mastery of the knowledge, but also the students' psychological quality and the role of stability.

2. Overview of the Cloud Theory

2.1 The Concept of Cloud

a) Definition and properties of cloud

The cloud is a transformed model with the language value expressed uncertainty transformation model between some concepts and its quota expression. It reflects the concept uncertainty in the natural language, reflects the relation of the randomness and the fuzziness, make up the map between quota and the qualitative.

We suppose that U could be the quota universe with precise numerical representation, c is a qualitative concept on the U , If quantitative value $x \in U$, and x is a random realization of the qualitative concept c , x has the stable tendency random number to the determination of the degree $\mu(x) \in [0,1]$ of c , $\mu: U \rightarrow [0,1] \quad x \in U \quad x \rightarrow \mu(x)$ Then the x 's distribution in the domain of U is called cloud (Cloud), each x is called a cloud drop [5]. The cloud is composed of many cloud drops; each cloud drop x is a spot of this qualitative concept maps the number field space, namely a specific implementation.

b) Digital Features of Cloud

The cloud overall characteristic can be reflected by the number of features of the cloud: respectively is Expected value E_x , Entropy E_n and Hyper Entropy H_e , marked $C(E_x, E_n, H_e)$. They reflect the quantitative characteristics of qualitative concept [6] [9]:

Expected value E_x : It expresses an expectation of the distribution of cloud drop in the domain space. Popularly, that is the spot can most represent this qualitative concept in the domain space, and reflecting the cloud center-of-gravity position.

Entropy E_n : It is an uncertainty quantity of qualitative concept. On the one hand, it reflects accepted by the scope of the value of the language in the domain space, namely ambiguity. Entropy is measure of qualitative concept either or; On the other hand it reflects the point represents the probability of the value of the language in the domain space, and expresses that the randomness of cloud drop appears of qualitative concept. Entropy reveals the association of the fuzziness and the randomness.

Hyper Entropy H_e : Hyper Entropy is uncertainty measure of Entropy, namely Entropy of Entropy. Hyper Entropy reflects uncertainty measure coherence of all the points of the language value in the domain space, namely cloud drop condensation.

c) Degrees of Membership of Cloud

Let x is an ordinary set, then $x = \{x\}$ becomes the domain. If the elements of the domain are simple and orderly, according to a rule f , then x can be map to another orderly domain x' , One and only one x' in x' corresponds to x , then x' is the foundation variable, the distribution of the degree of membership on the x' named subordination cloud.

In the classical set, the elements belong to, or not belong to a set. Fuzzy set presents the challenge, thought that it has the 3rd kind of relations between the element and the set: In one case belonged to, a value on the [0, 1] expresses the degree of belonging, is called degree of membership [6] [9].

Definition: Let U be a domain, the domain U anyone mapping to the real interval $[0, 1]$

$$\begin{aligned} \mu_{\tilde{A}} : U &\rightarrow [0, 1] \\ \forall x \in U, x &\rightarrow \mu_{\tilde{A}}(x) \end{aligned}$$

All are determined a fuzzy set \tilde{A} on U , $\mu_{\tilde{A}}$ is called the membership function of \tilde{A} , $\mu_{\tilde{A}}(x)$ is called x to degree of membership of \tilde{A} .

$$\text{Marked } \tilde{A} = \left\{ \int \frac{\mu_{\tilde{A}}(x)}{x} \right\}$$

As a result, the classical set becomes a special case of the fuzzy set, the degree of membership value in $[0, 1]$. Similarly, the degree of membership of cloud drops is a degree of subordinates in the degree of some concept cloud model, the value is also in $[0, 1]$ [1] [4] [8].

2.2 Cloud Model

Cloud model (Cloud model) is a transformation model between qualitative and quantitative, and it is the foundations of cloud computing, cloud reasoning, cloud control and so on methods, and it is also the basis of the model of quality assessment of student learning. It has quit a lot of methods to realize the cloud model specifically, and Constitute different types of clouds, Such as symmetrical cloud model, half cloud model, combination cloud model and so on. According to the dimension of the domain U , it also can be divided into one-dimensional cloud, two-dimensional cloud, multi-dimensional cloud, etc. [6].

a) Cloud Generator

The normal distribution is one of most important distributions in the probability theory, usually it was expressed with the average value and the variance two figures characteristic. Usually in situation, the students test scores follow a normal distribution; therefore, it is a certain rationality to described by the normal cloud.

The cloud production algorithm modulation or solidifies the hardware, we call it the cloud generator (Cloud Generator, CG). Normal cloud generator (Cloud Generator) is one specific algorithm which achieves with the computer, can also achieve with the integrated microelectronic devices. As a result of normal distribution's importance, the normal cloud generator mainly includes: forward cloud generator, reversion cloud generator, x condition cloud generator and y condition cloud generator [7].

b) Cloud Transformations

The cloud transformation is one kind data “soft” division method based on the cloud model, the cloud transformation is a process which extracts the concept from some attribute actual data distribution, to realize the transformation from the quantitative data to the qualitative description. So-called cloud transform (Cloud Transform), is to make an arbitrary irregular data distribution, Carries on the mathematical manipulation by according to some kind of rule, causes it to become the certain size different clouds’ superimposition, the superimposition clouds are more, the error is less. Namely assigns of discourse some data attribute x frequency distribution function $f(x)$ in the universe, and according to the attribute value x frequency's reality distributed situation, automatically generate a number of different particle size cloud $C_i(E_{x_1}, E_{x_2}, E_n, He)$ superposition, each representative of the qualitative concept of cloud, which range from continuous to discrete values the concept of the conversion process, is called the cloud transform[4][8].The mathematical expression is:

$$f(x) \rightarrow \sum_{i=1}^n (\alpha_i * C_i(E_{x_1}, E_{x_2}, E_n, He))$$

In the formula α_i is the scope coefficient; n is the number of the separate concept after transformed generation.

The basic idea is to make the high frequency data value to the contribution of the qualitative concepts more than the low frequency data value on the contribution of qualitative concepts, In the data frequency distribution's partial maximum value achievement concept's central - cloud model's mathematic expectation, higher its peak value is, indicated that more the data gather, then primordial consideration its reflection of

qualitative concept; Then subtracts the correspondence numerical part of this qualitative concept in the original distribution, and seeks for the partial maximum value again; And so on, Finally, according to the known data frequency distribution function $f(x)$, obtains the fitting error function $f'(x)$ and each cloud model distribution function, calculates each concept 3 characteristic values based on the cloud model.

3. The Construction of Quality Evaluation Model of Student Learning Based on Cloud Model

This article constructed student learning assessment model based on the cloud model, The model can carry on processing many times students' test scores in some subject learning phase, Such as the psychological quality of students during the test and the students have learned mastery of subject knowledge, etc, Mining hidden one of the useful information provides the reference for student's study tasks and teacher's teaching strategy. There is learning steps of quality evaluation model based on cloud model:

Step1: Select a certain amount of usually test scores from purpose of the historical database subject takes as the training data set, Then Carries on processing using the improved treatment of cloud transformation algorithm to obtain knowledge of the subject which can represent the qualitative concept $A_i(E_{x_1}, E_{x_2}, E_n, H_e)$ of this subject knowledge mastery;

Step2: Appraised student test scores to regard as the cloud drop, In view of each cloud drop, calculates each correspondence student score's normal cloud $C_i(E_x, E_n, H_e)$ with the reversion normal cloud generator;

Step3: Step2 Obtains each E_x are taken as import of the x conditions cloud generator respectively, and find the membership of each concept A_i , and owned by the maximum value criterion to determine the final concept.

The quality assessment of student learning model of the above steps designed, firstly use of historical data information, and describes the extent of their mastery of knowledge by calculating the qualitative concept A_i . Among them, the specific types of the concept A_i is decided by the data actual distribution and the assigned error threshold θ , and θ can be given according to experts' the experience. Secondly, as the student in certain stage's study, several usually tests scores are similar to the normal distribution, so the reverse of the normal cloud generator generated the concept of the normal cloud $C_i(E_x, E_n, H_e)$ which can reflect the quality of the students' psychological quality and the display stable degree during the exam. Bigger the E_n , H_e are, to show that psychological quality and the display stability are worse, and test scores' quantity is bigger, then produced the normal cloud's digital characteristic's error is smaller, when the experiment proved quantity is bigger than 10, it can obtain E_x accurately, the error is smaller than 0.01, It reflects cloud theory's unique advantages in carrying on qualitative assessment. Entire qualitative appraisal's process schematic drawing as shown in Figure 1:

4. Experiments and Analysis

It has carried the qualitative evaluation of higher mathematics scores for 212 students in a class of a Vocational College, Shandong Province by using the evaluation model base on cloud theory. Firstly according to algorithm (1) step, Former students were selected 1,000 ones' ordinary test scores of higher mathematics in the school to process with improving cloud transform algorithm, and Obtained the three concepts of the knowledge in qualitative: "Poor grasp of knowledge" $A_1(0,42,6,0.8)$, "General grasp of knowledge" $A_2(59,78,5,0.7)$, "Good grasp of knowledge" $A_3(91,100,6,0.5)$, Cloud representation is shown in Figure 2.

We can see A_1 with A_3 are half trapezoidal cloud concept from Figure 2, A_2 is the trapezoidal cloud concept, the three concepts carry on the qualitative description to grasp the degree of mathematics knowledge.

Secondly, according to algorithm (2) step, It takes the 12 usually test scores of students' higher mathematics in the class near stage as a cloud, and obtains the respective corresponding normal cloud through the reversion normal cloud generator, the results are shown as in Table 1.

It can be seen from Chen ying, Gao jie, and Zhang yue students' the concept of the normal cloud corresponding to the number of features in table 1, Table 1 shows that Chen Ying and Gao jie's number of features E_n and H_e are bigger than Zhang yue's. We may obtain the following conclusion, Chen Ying and

Gao jie's score are higher, but they displays unstable because the psychological factor or other factors influence it, while Zhang Yue's score is somewhat low, but displays is relatively stable.

Table 1 some subject test scores of students in a conceptual form of cloud

Name [Ⓢ]	12 times usually test scores in some subject [Ⓢ]	Normal Cloud [Ⓢ]
Chen ying [Ⓢ]	88,69,84,95,77,82,86,94,93,81,85,98 [Ⓢ]	$C(86,5.9,0.7)$ [Ⓢ]
Gao jie [Ⓢ]	90,92,89,84,91,97,95,88,87,85,86,96 [Ⓢ]	$C(90,3.6,0.2)$ [Ⓢ]
Zhang yue [Ⓢ]	72,70,69,77,75,81,80,78,76,79,82,86 [Ⓢ]	$C(77,3.2,0.4)$ [Ⓢ]
..... [Ⓢ] [Ⓢ] [Ⓢ]

Finally, according to the algorithm (3) steps, we can further draw on the membership of the qualitative concept A_1 , A_2 and A_3 , It Obtains the results of the respective concept with degree of membership maximum value criterion and lists in Table 2.

Table 2 corresponding knowledge grasps the degree concept table

Name [Ⓢ]	μ_{A_1} [Ⓢ]	μ_{A_2} [Ⓢ]	μ_{A_3} [Ⓢ]	Corresponding concept [Ⓢ]
Chen ying [Ⓢ]	0.02 [Ⓢ]	0.56 [Ⓢ]	0.83 [Ⓢ]	A_3 [Ⓢ]
Gao jie [Ⓢ]	0.01 [Ⓢ]	0.46 [Ⓢ]	0.98 [Ⓢ]	A_3 [Ⓢ]
Zhang yue [Ⓢ]	0.02 [Ⓢ]	0.84 [Ⓢ]	0.46 [Ⓢ]	A_2 [Ⓢ]
..... [Ⓢ] [Ⓢ] [Ⓢ] [Ⓢ] [Ⓢ]

We can see that each student in the class grasps the degree to the higher mathematics knowledge from Table 2, Such as Chen ying's corresponds to the concept A_3 , Therefore, it obtains that she grasps well in higher mathematics, while Zhang yue's corresponds to the concept A_2 , It can obtain that he grasps general in higher mathematics. The experimental result indicated that the cloud theory is applied in education system to construct evaluation model of the quality of student learning, the students' scores are divided into different levels, then evaluate it feasible and effective to grasp the degree to the knowledge. On the basis, the students may choose learning resources by according to their mastery of the subjects; At the same time, teachers may adjust teaching strategies or the development of new teaching plan by according to the results of student evaluate learning.

5. Conclusions

In this paper, it studied student study quality assessment system in the educational system combined with cloud theory. It constructs the quality of students' study quality assessment model based on cloud model, and it has achieved to a soft division of students' achievement, The result of relevant evaluation can reflect not only students' mastery of the knowledge, but also students' psychological quality and the role of stability. This article has been further experimented the fact that it is an beneficial for dynamic teaching of teachers and students, it do better to reflect the teaching thinking of the center of students, and improve teaching effect and learning quality, Thus, it has laid a good foundation for the further research of study quality assessment based on cloud model applied in the personalized intelligent tutoring system.

6. Acknowledgment

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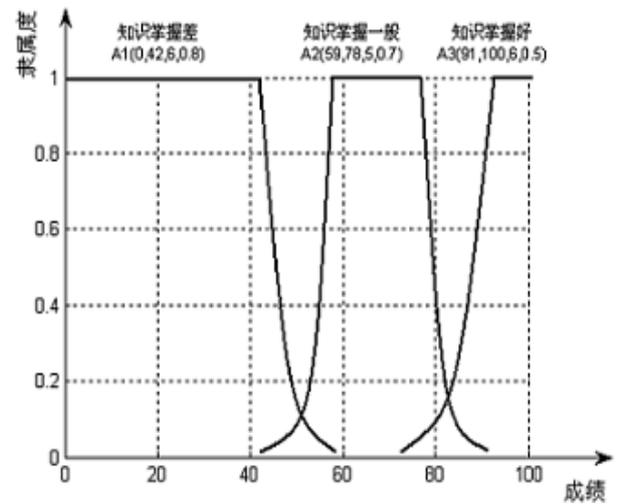
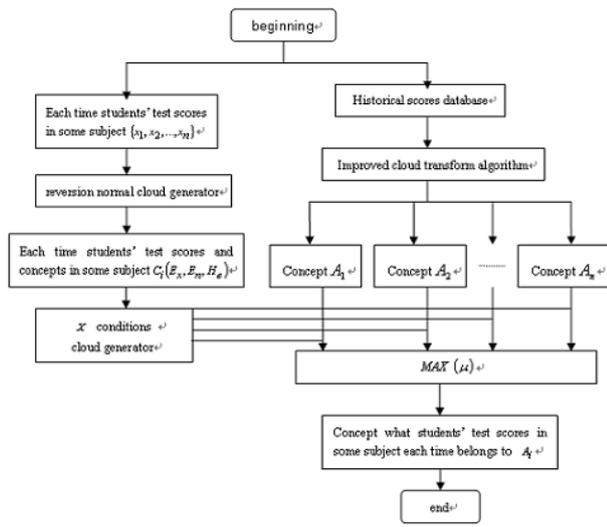


Figure 1 Schematic diagram of evaluation model

Figure 2 the knowledge grasps the degree qualitative concept map