

Research Article

The Application of Network in the Experimental Teaching of Food Technology Based on Cloud Computing

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Abstract: In this study, a cloud computing model was established and research and development of food technology network course education based on cloud computing is a kind of practice and the accumulation of the technology, which can develop a perfect function, with good interactive performance, can solve various problems of food technology. And the effect of prediction model time is more close to actual time, can efficiently limit the possibility of falling into local convergence, the optimal solution's time of objective function value is shorten which meet the food science student's needs. The application of network technology based on cloud computing, can avoid the weaknesses of the traditional teaching methods, enrich the teaching contents, improve teaching effect, perfect assess system and also play an important role in training food science students' the team spirit.

Keywords: Food technology, interactive performance, network cloud computing

INTRODUCTION

"Food technology" is a degree course of food specialty in college, specialized courses, with the and it is one of the most important courses of comprehensive theoretical knowledge and high demands of practical ability. Over the years the reform of this course has always been the research hotspot. Cloud computing is a now wildly used architecture hot, it's product of the development of grid computing, distributed computing, network storage and parallel processing (Zhang and Li, 2010). It shows that the food science student's applications can operate without personal computer but the server cluster in the Internet. There are three basic forms of cloud computing services including: Infrastructure as a Service (IAAS), Platform as a Service (PAAS) and Software as a Service (SAAS) (Nguyen *et al.*, 2011). In cloud computing, the allocation of resources is a very important issue, the unsatisfactory allocation of resources can easily led the cloud's servers crashed and other servers in idle. So in cloud environment, the problem mostly need to solve is the ways to control any server's resources allocation and use condition by the information communication of local and in the Internet to make better use of the resources. Literature (Yikui *et al.*, 2011), we can share the network information resources, rapid evolution and the development of the Internet technology and the popularity of various regions in the world scope continents, to learn to use the network will become an important way in the future education and learning areas, Internet applied to teaching and learning will

become our future study and the inevitable trend of the development of our life learning.

MATERIALS AND METHODS

Basic knowledge of cloud model: The cloud model is a transformation model uses linguistic values to express the uncertainty between a certain conception and its quantification expression (Li *et al.*, 2012), it fully combines fuzziness and randomness and forms the mapping between qualitative and quantification (Fig. 1).

Sets U is discourse domain expressed by accurate numerical value, A is corresponding qualitative concept in U . If quantitative value $x \in u$ and x is a random implementation with likely normal distribution of qualitative concept A in discourse domain U , the certainty degree $A(x) \in [0, 1]$ of x to A is also a random number with likely normal distribution, then data array $(x, A(x_i))$ is called as cloud drop, the whole element $x_i (i = 1, 2, \dots, n)$ in discourse domain U and its certainty degree $A(x_i)$ for A, i, e, n data array $(x, A(x_i))$, forms the cloud model with n cloud drop, calls x distribution in discourse domain U as cloud distribution. The number characteristics of cloud model are expressed as Expectation (Ex), Entropy (En) and excess entropy (He). Among them, Expectation (Ex) refers to the central value of discourse domain U , is the center of qualitative concept, reflects the cloud focus of the whole cloud drop swarm; Entropy (En) refers to the range which can be received by fuzzy concept, $En > 0$; reach an agreement of cloud drop of representation

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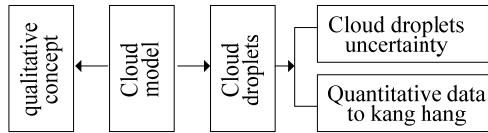


Fig. 1: Transformation schematic of cloud mode's qualitative concept and quantitative data

Table 1: Sub-tasks and resources table

The subtasks	Resources	Running time	Running costs	Total resources
n_1	m_1	$t(n_1, m_1)$	$\cos t(n_1, m_1)$	$Sm = \sum_{i=1}^n m_i$
n_2	m_2	$t(n_2, m_2)$	$\cos t(n_2, m_2)$	
...	
n_n	m_n	$t(n_n, m_n)$	$\cos t(n_n, m_n)$	

n_i : The number of sub-tasks; m_i : The number of resources; $t(n_i, m_i)$: The time in task i , resources j ; $\cos(n_i, m_i)$: The costs in task i , resources j ; In these above models, supposes the resources in cloud computing reasonable can be distributes into the computing resources of sub-tasks and ensures the shortest time and the lower costs for complementing the sub-tasks

excess entropy (H_e) is a uncertain measurement of entropy, i, e , the excess entropy is the entropy's of entropy, $H_e > 0$. The excess entropy reflects the degree qualitative concept or the concentration degree of cloud drop's representation qualitative concept; the bigger excess entropy is, the qualitative concept has worse common sense or the qualitative concept is worse decentralization.

Design principles of food technology network course of cloud computing: The network principle, it is not restricted by time and space, sharing and integration with various resources, network cloud computing must be able to through this network platform to transfer a large amount of learning information modernization, but also through the computer terminal to the use of and access to cloud computing content (Geng *et al.*, 2013). Must have its own position with space and realm name, the only way to ensure the function of cloud computing, network teaching for a greater degree to replace the existing ordinary teaching will be the future, meanwhile, accelerated the information to further develop the technical level and technical innovation, further improve the overall quality of food science teachers, teaching the concept of further update and so on. Prospects for the development of network cloud computing is broad, driven by the software on the network, to achieve a more extensive development of nationwide fitness campaign, the network is essential.

The principle of autonomy: People there are individual differences in terms of cognition, unique methods and habits have different cognitive learning styles on the outside of the information. The independent performance of cloud computing should allow the food science student according to their own learning goals, learning to arrange the learning progress and learning time and can learn the main content specific to each training process and the food science student can control the information features video, at

any time to play music, fully reflects the food science students' learning autonomy and has the advantage of flexibility cloud computing, changed the traditional teacher teaching and classroom centered teaching mode in the past to a great extent, thus forming a food science student-centered teaching mode, such teaching mode is more advantageous to teach food science students in accordance of their aptitude and the implement individualized teaching goal (Geng *et al.*, 2010).

In cloud computing environment, the mostly used model is Map/Reduce, this model operates well in large-scale parallel task. Especially in cloud computing environment, it needs to processes each cloud food science student's resource number, time, network channel fee, etc., in time. The currently related task scheduling algorithm focuses on the needs of overall task, considers less about the cloud food science student's complementing time, which led to unreasonable in time and resources distribution for the food science students when multiple tasks operates (Cordero-Grande *et al.*, 2011). Supposes cloud client's tasks of cloud computing as Table 1:

- Divides large-scaled task into relatively small tasks, divides in average, the sub-tasks' operating time are similar.
- The number of resource distribution offers enough for sub-tasks.
- Reasonable defines sub-task occupies resources time.

The overall diversity and difference principle of a high quality cloud computing should be a holistic and contains a variety of cyber source information, the newer and better information has been added to the making of information, but also contains a large number of unique properties different from other information, always can let food science students like and love.

Interactive principle of interaction between information content and food science student's most important link, is the important difference between a network cloud computing with traditional teaching means, the network cloud computing developed in full consideration of who is the main object, fully in each plate block design as far as possible, adding more evaluation and interaction.

Mathematical model: The resources distribution under cloud computing related some specification for cloud food science students; they have this restrictions as following in general:

- The required order is given for each cloud food science student
- Can only receives 1 requirement of 1 food science student in 1 period of time, each food science

student can only be occupied by one server in cloud server, 1 started it cannot be disrupted

- Each task can only operate once in one cloud server in the whole machining process
- Without considering the superiority of each task

The mathematic model of this problem can be expressed as following:

$$FinishTime_{ij} - MachiningTime_{ij} + M(1 - \alpha_{ijk}) \geq FinishTime_{ij}, i = 1, 2, \dots, n, j = 1, 2, \dots, n \quad (1)$$

$$FinishTime_{jk} - FinishTime_{ij} + M(1 - \beta_{ijk}) \geq MachiningTime_{oj}, i, k = 1, 2, \dots, n, j = 1, 2, \dots, n \quad (2)$$

$$FinishTime_{ij} \geq 0, i = 1, 2, \dots, n, k = 1, 2, \dots, m \quad (3)$$

$$Min \max \{ \max FinishTime_{ik} \} \quad (4)$$

Formula (1) refers to the operating order of each sub-task determined by each task. Formula (2) refers to the order of each sub-task; formula (3) refers to each sub-task's time variable restriction. Formula (4) refers to objective function. $FinishTime_{ij}$ refers to the complementing time of task i in server k , $MachiningTime_{oj}$ refers to the processing time of task i in server k , M is a coefficient defined values, α_{ijk} and β_{ijk} are expressed as following: α_{ijk} is 1 refers to server j operating task i in server k , α_{ijk} is 0 refers to other conditions. β_{ijk} is 1 refers to task i processing task i in server k , β_{ijk} is 0 refers to other conditions.

RESULTS AND DISCUSSION

The cloud model's spray characteristic refers to the character of cloud drop distributes around cloud expectation curve's discrete degree. Professor Liuyu, etc. made researches on excess entropy measures cloud drop's discrete degree with fixed entropy. But these works did not show the essence factors of determine cloud model's spray characteristic, i.e., the standard deviation Y 's distribution of cloud drop quantitative data X determines the cloud model's spray characteristic. The same as the cloud distribution probability density of cloud model algorithm identified is the theoretical basis of uncertainty reverse cloud model algorithm, this chapter revised the cloud distribution probability density and gave a strict proof according to spray characteristic $Y > 0$.

The positive direction cloud model algorithm steps in one-dimension theory's domain are as following:

Step 1: Generates normal random number y_i whose expectation is E_n , standard deviation is He .

Step 2: Generates normal random number x_i whose expectation is E_x , standard deviation is y_i , x_i is

a concrete and quantitative realize of qualitative concept A operates in its corresponding quantitative theory of the domain U , called cloud drop qualitative data.

Step 3: Calculates $r_i = \exp(-\frac{(x_i - E_x)^2}{2y_i^2})$, r_i is the certainty degree or subjection degree of x_i belongs to qualitative concept A .

Step 4: Repeats step one to three until generates n cloud.

Prove: because $y - r(E_n, He^2)$, E_n refers to the discourse domain must be greater than zero, as $x - N(E_x, y^2)$, y , as the standard deviation of x , must be greater than zero, so according to normal distribution random variable meets 3σ rule, gets $E_n/He \geq 3$. Besides, the probability density of Y is:

$$x_i(y) = \frac{1}{\sqrt{2\pi}He} \exp\left[-\frac{(t - E_n)^2}{2He^2}\right]$$

When $x_i = y$, the conditional probability density is:

$$x_{i,j}(x|y) = \frac{1}{\sqrt{2\pi}y} \exp\left[-\frac{(x - E_x)^2}{2y^2}\right]$$

Gets joint probability density through conditional probability density formula:

$$x(i, j) = \frac{1}{2\pi H_e j} \exp\left[-\frac{(j - E_n)^2}{2He^2} - \frac{(i - E_i)^2}{2j^2}\right]$$

Gets probability density which marginal probability density is cloud distribution through joint probability density formula:

$$x_i(x) = \int_x^y \frac{1}{2\pi H_e y} \exp\left[-\frac{(y - E_n)^2}{2He^2} - \frac{(x - E_x)^2}{2y^2}\right]$$

This formula has no analytic form Quod x_i demonstrandum.

From step 2, 3, y is the standard deviation of cloud drop qualitative data X , its distribution character directly determines the cloud drop's distribution character, the bigger distribution scale of Y , the more cloud drop distributes discrete. Because:

$$Y \sim N(E_n, He^2)$$

This text takes $a = E_n/He$ as the measurement of cloud drop's discrete degree, called spray factor,

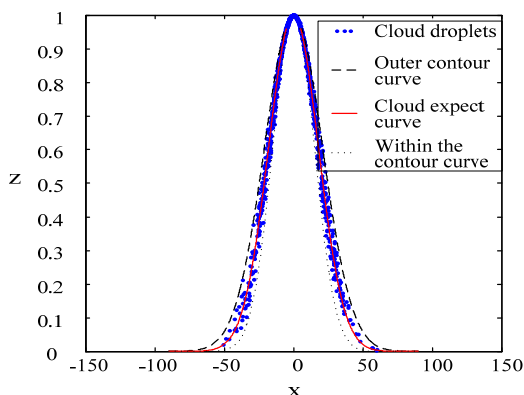


Fig. 2: The cloud drop's distribution map when $a = 18$

because qualitative data's standard deviation Y , E_n and H_e must be greater than zero at the same time so $a \geq 3$. Spray factor a integrative considers the nature that standard deviation Y of cloud drop's qualitative data X must be >0 , the distribution of Y directly affects cloud drop discrete degree and a determines the distribution character of Y , so 0.0 can be the significant digital characteristic of cloud model to presents the discrete condition of cloud drop's distribution. The spray characteristic of cloud model has the following characters.

Character 1: The distribution characteristics of cloud drop's qualitative data standard deviation determines the cloud drop's distribution characteristics, a refers to the cloud drop's discrete degree and $a \geq 3$. The smaller a be, the bigger discrete degree of cloud drop's distribution; when $a = 3$, the discrete degree of cloud drop's distribution reaches the biggest; the bigger a is, the smaller discrete degree of cloud drop's distribution, finally tends to normal distribution. Now the cloud drop all approximate distributes on cloud expectation curve.

Character 2: Cloud distribution's corresponding range of spray factor: $3 \leq a \leq 18$.

The spray factor determines the distribution characters of cloud drop qualitative data and the kurtosis describe the figure of data distribution at the same time, the kurtosis of normal distribution is 3, if the kurtosis of cloud distribution values around 3, the cloud distribution turns to normal distribution. The kurtosis of cloud distribution defines as following.

Definition 1: The kurtosis of cloud distribution:

$$K(X) = 9 - \frac{6}{\frac{H e^2 \sigma^2}{E n^2 \sigma}} = 9 - \frac{6}{\frac{1 \sigma^2}{\alpha^2 \sigma}}$$

From this formula, spray factor determines the transformation between cloud distribution and normal distribution. When $a = 18$, the kurtosis of cloud distribution is 3.036, draws its cloud drop distribution as Fig. 2. From the figure, when cloud distribution approximate degrades into normal distribution. i.e., essentially, when spray factor meets $3 \leq a \leq 18$, the distribution of cloud drop's qualitative data can be called as cloud distribution. So in later discussion, can only considers the condition when spray factor meets $3 \leq a \leq 18$.

CONCLUSION

Cloud computing is a new-style kind of teaching model, innovation and development is also the modern teaching mode, has powerful function to promote the development of Internet, make the power of the cloud computing is more and more big, a cloud computing requires producers not only has the course of professional knowledge, but also must have the comprehensive use of computer software and education science, psychology, aesthetics and other subject knowledge to do support, information R & D needs to use engineering, science, literature and complement each other's advantages of multi subjects. Development and use of the cloud computing, can add features to high education, so that the food science student can play the main role, using the network function complement each other, improve learning efficiency; influence to the field of food science education in a positive, it will also become one of the most powerful tools of adolescent food technology and learning in the new century.

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