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Research Article

Virtual Reality Technology Applied in Food Teaching System

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Abstract: The study attempts to apply the virtual reality technology in food processing teaching, to analyze the algorithm in food processing, to improve the teaching quality and efficiency in order to save manpower and material resources. The development of virtual reality technology opens a new road to the progress of the food industry continuously, the development of virtual technology provides the technical support for efficient food processing methods, In the food processing teaching process, it can be effective to improve the teaching quality and efficiency combining virtual technology with food processing teaching, using the way of virtual animation and simulation.

Keywords: Food processing teaching, technical support, virtual reality technology

INTRODUCTION

In recent years, China's food industry has entered a period of rapid development, but also led to food science teaching and research progress. In this process, advanced equipments equipped with insufficient and relative shortage of funds were gradually revealed and have become a bottleneck restricting the development of food science teaching, scientific research factors. With the successful application of the virtual food system in many areas, we gradually know a way to solve the above problem. In addition, with simulation studies in related discipline penetration, the integration of virtual reality technology becomes the needs of the development in an all-around way of food science comprehensively.

The virtual reality food teaching system can provide many kinds of feedback for the users, including visual, auditory, haptic feedback, etc. These feedback technologies can improve users' evaluation on the sense of presenting, which is provided by the simulation system of virtual reality, enhancing the performance of subjects who completed the test task in a simulation environment. At the same time, with the development of digital human modelling technology, the virtual reality simulation system has emerged that can make users be immersed and experienced personally, interacting with the objects in virtual environment and put it into the use of actual research and evaluation (Wang, 2004). Virtual reality foods simulation system is composed by virtual reality technology and interactive foods simulation which has reference value in theory and a certain significant meaning in improving the learning level of the students.

MATERIALS AND METHODS

The organization in the process of virtual food processing teaching: The virtual reality foods teaching system generally includes the video image that is projected on the screen and audio information that is played synchronically. In addition, using the sensors can make virtual reality foods simulation system real-time monitor the practical performance of the objects and get relevant data, then computer is used to analyze the data acquired by sensors, teaching the correspondent feedback to the object's behavior accordingly (Williamson, 2008). The current virtual reality foods teaching system is the system that integrate these functions into one, providing users with real foods competition environment with a virtual reality environment, in this competitive environment, adding some elements such as visual simulation and auditory simulation, etc, teaching the students or foods participants, etc., obtain real foods experience.

Learning is a process of unceasing introspection and improvement, so students should have an objective evaluation about themselves' learning effect after getting the answers in the inquiry-based learning. For example, what I have finished, whether am I satisfied with the results, which parts to need further modification and improvement and is there a better way to accomplish teaching contents and so on. Of course, in addition to the self-assessment, students need to evaluate the team work of members duly, summarize the beneficial experience and analyze the existing problems and related factors, so as to provide useful feedback for food processing works. Meanwhile, teachers should make a integrate assessment to the whole task-driven teaching process. Through reflection, students constantly make some adjustments and

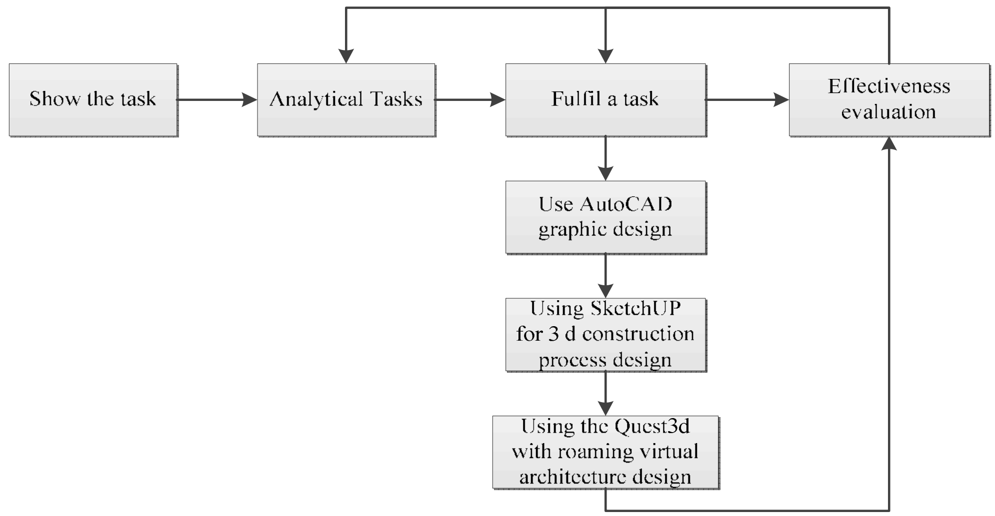

Fig. 1: Food processing teaching process

feedbacks about design works, so that they can gain new knowledge and new experience and strengthen and enrich individual experience.

This study mainly includes the following four steps: first, we should formulate virtual food processing specification elaborately and show the case of virtual food processing; Second, according to the assignment book, we should establish the teaching scene of food processing that the specification contains and analyze the class design tasks; Then, the implementation of the teaching task, namely, refers to guide the students to complete the design task step by step, design and communicate at the same time among the students or between students and teachers; Finally, after the completion of the design task, the students are exposed to the virtual food processing scene to roam and interact and they should offer feedbacks about defects in the design and modify them timely. On teaching methods, this study chooses the task-driven teaching method, which includes the process of "supposing questions (task exhibition) -analyzing question (analyzing task) -disambiguating (problem solving) -questioning (effect evaluation and feedback)" (Fig. 1), which is helpful for students to overcome the one-way thinking, to learn the multi-way thinking and to use the knowledge comprehensively to strengthen students' innovation ability (Luo, 2003).

Step 1: Supposing questions (task exhibition): In this step, the teacher will create a scene and show the food processing task. Teachers understand the new issues of food processing in the scene by creating task scene of virtual food processing works. Meanwhile, teachers put forward the overall design goal according to the students' new problems. Students experience the virtual scene and extract the relevant experience in their cognitive structure and try to use the existing knowledge to solve problems in the teaching situation, which can stimulate students' thirst for knowledge and the desire of exploring problems.

Step 2: Analyzing questions (analyzing tasks): In the first step, the general assignment of the food processing that teachers show usually is complex and contains too much information. Therefore, students can't immediately come up with a designing scheme. At the time, it is necessary that teachers lead the students to analyze teaching assignment book together and let students use their existing experience to decompose the whole design task into small tasks, which requires that these small tasks must link with each other and meet the requirements of the total food processing assignment book.

Step 3: Disambiguating (problem solving): In this step, it mainly refers to that students develop their own subjective initiative, explore questions actively and realize the small tasks one by one which be decomposed in the last step under teachers' guidance. Students need to combine with their initial capacity at this moment to complete the construction of new knowledge and establish the related links of each small task and then to test and to verify, ultimately attain the needed various knowledge and capability of completing the whole tasks.

Step 4: Questioning (effect evaluation and feedback): Learning is a process of unceasing introspection and improvement, so students should have a objective evaluation about themselves' learning effect after getting the answers in the inquiry-based learning. For example, what I have finished, whether am I satisfied with the results, which parts to need further modification and improvement and is there a better way to accomplish teaching contents and so on. Of course, in addition to the self-assessment, students need to evaluate the team work of members duly, summarize the beneficial experience and analyze the existing problems and related factors, so as to provide useful feedback for food processing works. Meanwhile, teachers should make a integrate assessment to the whole task-driven teaching process. Through reflection, students constantly make some adjustments and feedback about design works, so that they can gain new knowledge and new experience and strengthen and enrich individual experience.

RESULTS AND DISCUSSION

Animation algorithm of virtual food processing teaching: This section studies food teaching animation in the virtual scene (Rajan, 2009). Elastic deformation is a common pattern of deformation, after the object occurred the deformation, it can restore the original shape according to the elastic model. The algorithm of elastic deformation is based on particle system, at the same time, gridless method is adopted to improve the efficiency of the calculation of deformation (Hu, 2002). It will make each vertex of the dimensional objects that formed the three-dimensional deformation as particle, thus, the deformed object can represent a particle system, by controlling the particle, it can also change the shape of object. At the same time, it sets up a corresponding target position for each particle that consisted of the deformation objects. After occurring the deformation, elastic power will pull the particles to the target position, so that the deformed object can restore the original shape, the object in the thesis that is dealt with deformed algorithm is a three-dimensional object composed by the particle with quality and initial position. Because there is no connected information between each particles, so it need not consider the interaction between particles, it only need consider the collision of particle and environment, as well as the external force of the particle. It is assumed that the corresponding relationship is known between the initial shape and the actual shape of the object (Chen, 2006). Therefore, the main task is to determine the optimal rigid transformation of the two point clouds, the problem can be stated as follows: for the two groups of given point: x_i and x_0, calculate the rotation matrix R and the translation vector t and t_0, minimizing the formula below:

$$\sum_i w_i(R(x_i^0 - t_0) + t - x_i)^2 \quad (1)$$

Among them, mi is the weight value of each point, apparently the optimal translation vector is the centroid of the initial shape and the actual shape, i.e.:

$$t_0 = x_{cm}^0 = \frac{\sum_i m_i x_i^0}{\sum_i m_i}, t = x_{cm} = \frac{\sum_i m_i x_i}{\sum_i m_i} \quad (2)$$

Among them, T_{vv} is a symmetric matrix, containing only scaling without rotation. Therefore, the optimum rotary torque array R is the rotating part of matrix T_{uv}, through the polar decomposition $T_{uv} = R \cdot S$, R can be obtained, among them, $S = \sqrt{T_{uv}^T T_{uv}}$ is the symmetric part, $R = T_{uv}S^{-1}$ is the rotating part, the final target position can be calculated by the following formula:

$$g_i = R(x_i^0 - x_{cm}^0) + x_{cm} \quad (3)$$

Among them, a is the parameter of object's hardness, f_{ext} is the external force on the particle. According to the algorithm of elastic deformation, it can realize the simulation of object's deformation:

$$v_i = (t + \Delta t) = v_i(t) + a\frac{g_i(t) - x_{i(t)}}{\Delta t} + \Delta t \cdot f_{ext}(t)/m_i \quad (4)$$

$$x_i(t + \Delta t) = x_i(t) + \Delta t \cdot v_i(t + \Delta t) \quad (5)$$

Furthermore, in order to show the equipment work processes more vividly, such as internal flow channel and connectivity relationship of the pump and valve, three-dimensional arrow models which fit the flow channel are established by 3D max, with the texture of liquid flowing effect, through GPU programming method to define custom Shaders, so as to achieve showing the hydraulic oil trend by three-dimensional arrows with animated textures, Cg code is as follows:

CG program:

```
……
v2fvert (appdata_base v) //vertex function
{
v2f o;
o.pos = mul (UNITY_MATRIX_MVP, v.vertex);
//view port transformation by projection matrix
o.uv = TRANSFORM_TEX (v.texcoord,
_MainTex); // texture coordinates
return o;
}
float4 frag (v2f i) : COLOR //fragment function
{
float4 outp;
float4defaultcolor = float4 (0.6, 0.6, 0.6, 0.26);
//define default color when texture is hidden
float4texCol = tex2D (_MainTex, i.uv);
//define texture and make assignment
//_MainTex_ST.xy corresponds to Tiling, Main
Tex_ST.zw corresponds to Offset
```

```
//changing_Lenth value by external scripts can realize texture animation effect
if (i.uv.y<_Lenth*_MainTex_ST.y)
outp = texCol;
//with in_Lenth value display the texture
else
outp = defaultcolor;
//out of_Lenth value display the default color
Returnoutp;
}
ENDCG
```

CONCLUSION

With the continuous development of the virtual animation technology, virtual animation and virtual simulation technology gradually should be applied to various fields, where the instruction of food by adopting virtual animation and simulation technology can better improve the teaching quality and efficiency, improve students' learning enthusiasm and motivation. At the same time, it can minimize loss of manpower and shall not be restricted by natural conditions, build a comfortable and safe learning environment. Through the research, it c has the vital significance to improve the level of food teaching.

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