

## Simulation of 3D Image Based on Unity3D

Mingsi Sun<sup>1\*</sup>, Shuaibin Wang<sup>1</sup>, Jingxin Geng<sup>1</sup> and Qi Gao<sup>1</sup>

<sup>1</sup>Electronical and Informationing Engeneering College, Jilin Agricultural Science and Technology College, Network Engineering, Jilin, 132101, China

e-mail: sunms19@mails.jlu.edu.cn

\*Corresponding author

**Keywords:** Unity3d; 3D visualization; Finger gesture operation

**Abstract:** It is difficult to describe custom cakes, and you can't do it yourself. You can use Unity3D and Visual Studio C# to design a simulation model of cake stereo model, and can generate mobile APP for use on mobile phones. The system will be Internet + traditional cake. Customize the connection, build a platform that can customize the cake, make the cake customizable. Users can download the cake model and cake parts on the mobile phone, perform gestures like editing blocks to edit the assembly, design the cake style by yourself. Once completed, the caker can view the user-created models and make them based on the user model, giving the user a unique cake on their birthday.

### 1. Preface

With the advancement of the times, people's demand for cakes is no longer limited to birthday celebrations, but simple reasons such as being happy and even wanting to eat. At this time, the traditional cake model is not enough to meet people's needs, people are more limited than the limited style. I prefer to customize myself.

However, it is often difficult to describe the appearance of the pastry to the pastry chef when customizing the cake. The pastry chef cannot intuitively understand the requirements of the customer. As a result, the cake often does not have its own characteristics, and the whole process becomes boring.

If the user can design a cake style that he imagines by moving his finger, the pastry chef can make the cake according to the model, so that the customer can get the cake that belongs to his own design, thus solving the problem that the user is difficult to open when customizing the cake. Clear and other problems.

Unity is a 3D engine that can easily realize building visualization, real-time 3D interaction and other functions, and supports C# programming<sup>[1][2]</sup>. After the system is finished, it can be packaged into a mobile APP, which can be downloaded and installed on the mobile phone. The system can be used for commercial purposes. The cake customization is connected with the model gesture operation, so that the cake customization is fun, operable, and strengthen the user's connection with the cake shop<sup>[3]</sup>.

### 2. The Composition and Structure of the Birthday Cake

#### 2.1 Birthday Cake Making Process

At present, the production process of most birthday cakes can be divided into three steps:

- (1) Finishing the cake embryo by the cake maker
- (2) Cream coating on the spliced cake blank
- (3) Add a small creamy "accessory" to the cake blank, such as cake crepe

In the case that customers need to customize, the customer's needs can be divided into custom cake top accessories, custom coating material color and so on.

## 2.2 The Structure of the Birthday Cake

According to the survey results of the cake shop, the structure of most cakes on the market can be decomposed into the structure of cake edible parts plus coating and cake blank according to the shape and the production process, as shown in Figure 1.

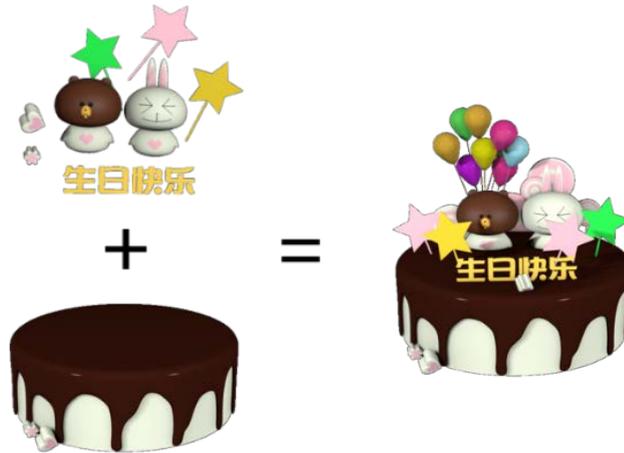


Figure 1. A schematic diagram of the cake structure

If the user has custom requirements, they need to make their own cake style, which can be used to transform the process of making the cake model into the process of selecting the cake accessories and the cake base<sup>[4][5][6]</sup>. This greatly simplifies the production of the cake model and makes it easier to understand.

## 3. System Development Process

The development of this system platform is to meet the needs of the user in the customization of the cake, to solve the user's unclear description of the cake customization or other reasons can not accurately describe the appearance of the desired cake, or the cake maker in the face of the user The shape of the cake that is expressed cannot be intuitively understood when demanding<sup>[7][8]</sup>.

### 3.1 System Function and Structure Design

(1) System function: enter the cake model editing scene, select the cake model, match, and then save the scene.

(2) Process design: Firstly, two design methods are provided. The cake embryo and small parts can be selected for splicing, or the existing cake model can be directly selected for modification; as shown in Fig. 2.

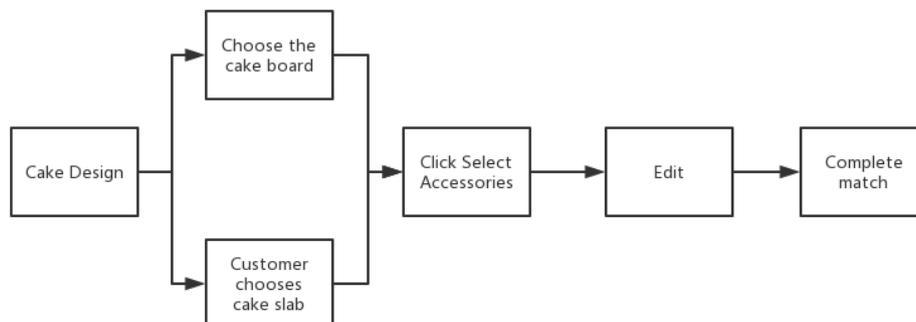


Figure 2. System function and structure design

### 3.2 System Development Process

The basic process of diy cake making system development is shown in Figure 3.

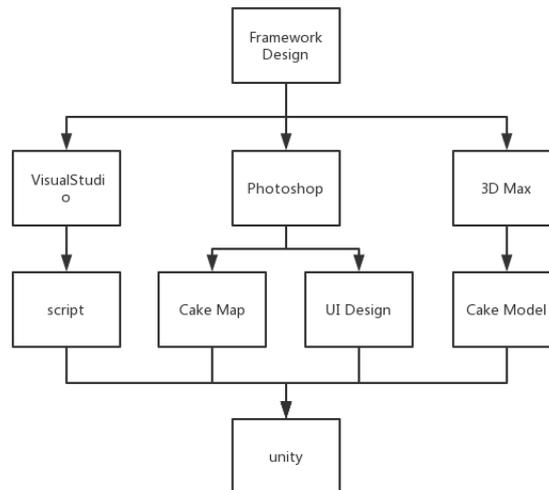


Figure 3. Cake model system development process

- (1) Create 3D models of cake slabs and cake widgets with 3DSMax.
- (2) Use Photoshop to map all the models and complete the mapping work on the cake model and the part model<sup>[9]</sup>.
- (3) Save the model in .fbx format and import it into unity, while rendering the bake to generate the final texture map.
- (4) Design ui interface.
- (5) In C#, use C# to write gestures, zoom in, zoom out, move, rotate, etc., and add gestures to the model.

### 4. System Key Technology and its Design

In the production process, the system's technology has gesture operation, dynamic loading and so on.

#### 4.1 Gesture Operation

The cake making scene needs to use the gesture operations, zoom in, zoom, move, rotate, including single-finger operation, two-finger operation, which can be easily achieved by calling the unity api. Each object in the scene is independent, with the script written in C# should be placed on each object in the scene<sup>[10]</sup>.

(1) The panning of the cake parts. After adding the gesture operation script on the cake and accessories, the user can click on the screen to obtain the object, and the single finger can be moved for 0.5 seconds to change the position of the object.

(2) Zoom in and out of the cake parts. When the user clicks on an object with a single finger click, the two fingers can zoom in and out.

(3) The rotation of the cake part. The definition is rotated by the axis of the object.

(4) The camera rotates to zoom in and out. When the user touches the screen and does not acquire the object, the screen is zoomed or zoomed in and out, and the parameters of the camera are modified. The object around the cake is rotated when rotated.

#### 4.2 Dynamic Loading

The cake simulation production system puts the template and widget resources of the cake on the server for users to download. It only takes up very little local resources. When the user selects the

template or component to download, it downloads from the server. To achieve this function, you need to use unity. Dynamic loading technology.

In this system, the dynamic loading technology solves the on-demand download and loading. The BuildPipeline. BuildAssetBundles method is used to package the scene into an AssetBundle. The AssetBundle is a resource compression package containing models, textures, pre-forms, sounds, and even the entire scene. Can be loaded when the program is running<sup>[1]</sup>.

## 5. Conclusion

This article introduces the cake making system based on unity, which makes the cake model interesting, so that users can design their own appearances on mobile phones and other terminals. Models and accessories are all completed by developers, users will not understand the difficulty of making 3D models. Going to the time of making the model. It does not replace the modeling tool. It just splicing directly on the template, similar to the dress-up game, but it directly simplifies the cake model and almost realizes the idea of making a cake model with fingers. The system combines virtual 3D models with traditional pastry customization, and is an easy-to-operate exploration of pastries, with certain applicability and commercial value.

## Acknowledgements

Supported item: National Undergraduate Entrepreneurship Project (NO.201911439030). <https://docs.unity3d.com/ScriptReference/AssetBundle.html>

## References

- [1] Jacobson J, Lewis M. Game engine virtual reality with CaveUT[J]. Computer, 2005, 38(4) :79-82.
- [2] UnityTechnologies. Unity Script Reference [EB/OL] 2019.2-003E.
- [3] CuberoS, AleixosN, et al. Advances in Machine Vision Applications for Automatic Inspection and Quality Evaluation of Fruits and Vegetables[J]. Food and Bioprocess Technology, 2011,4(4):487—504.
- [4] DaviesER. The application of machine vision to food and agriculture, a review [J]. Imaging Science Journal, 2009, 57(4) :197-217.
- [5] PatharePB, OparaUL, AI—SaidFA. Colour Measurement and Analysis in Fresh and Processed Foods: A Review [J]. Food and Bioprocess Technology, 2013,6(1):36-60.
- [6] Theanjumol P, Ripon S, Karaboon S, et al. Aromatic Thai Rice Identification by Near-Infrared Reflectance Spectroscopy[C]//Conference on International Agricultural Research for Development, Stuttgart Hohenheim. 2005.
- [7] Davrieux F, El Ouadrhiri Y, Pons B, et al. Discrimination between aromatic and non-aromatic rice by near infrared spectroscopy: A preliminary study [C]//Proceedings of the 12th International Conference, Auckland, New Zealand. 2007.
- [8] Gay, F., Mestres, C., Cao Van Phung, et al. Promising new technologies for classifying aromatic rice[J]. Omon. rice, 2004,12: 157-161.
- [9] Wang, L., Liu, D., Pu, H., et al. Use of Hyperspectral Imaging to Discriminate the Variety and Quality of Rice[J]. Food Analytical Methods, 2015, 8(2): 515-523.
- [10] Milan, S., H. Vaclav, B. Roger. Image Processing, Analysis and Machine Vision[M]. Second Edition. U.S.A: Thomson Brooks / Cole Press, 2001.