Study on the Construction Method of Graphic iPod Digital Model

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Abstract

With the increasing growth of computer technology, 3Dmax technology has also been applied more and more widely. With a wide variety of modeling means, 3DMAX plays an essential part to the development of virtual products that prevails currently, which could largely enhance the development rates of virtual products during construction. This paper expounds several common modeling means of three-dimensional models and their characteristics and application technique and then takes fabrication of an ipod as example, explicitly illustrates 3 dmax software modeling process as well as methods, wishing to help the products designer have a complete and in-depth understanding to the modeling and to make the process and methods applied in the practice of study as well as work.

Keywords: 3DMAX, products design, modeling, technique

1. Introduction

3dmax is a popular three-dimensional animation software at present, especially its strong modeling function can build a wide variety of virtual three-dimensional effects people prefer, which has been widely applied in many fields such as television special effect, architectural design, product design, multimedia production, games making, auxiliary teaching and engineering visualization. Model should built at first before producing any one of three-dimensional model, as it is the basis of the ultimate effect drawing and an accurate and succinct model is the fundamental guarantee for a success of effect drawing.

2. Types and Characteristics of 3Dmax Modeling

There are three kinds of high level modeling technologies: Grids MESH Modeling, POLYGON Modeling, PATCH Modeling, NURBS (non-uniform rational B-spline) modeling.

2.1. Polygon Modeling

Polygon modeling is one of the most traditional and classic modeling means. It is easy to understand 3Dmax polygon modeling means that is adaptable to the learners and can make the users have more space to imagine and modify in the process of modeling. There are two major orders in 3Dmax modeling: Editable Mesh and Editable Poly, almost all the geometry types can collapse into editable polygon grids, even the curve also can do, sealed curve can collapse into curved surface, in this way we can deserve the raw materials-polygonal surface.

In addition, the way of editing grids is greatly compatible, whose advantage is that the model built will take up less system resource and operates fast, even in the case of small numbers of surfaces, can also fabricate relatively complex models. It divides polygon into triangular surfaces, and then you can operate grids editing modifier or directly collapse the objects into an editable grid, among which mainly technology is involved with push-pull surface construction basic models and finally add up sliding grid modifier to improve

surface smoothness and accuracy. This type of technique uses many point, line and surface editing operations and has relatively high requirements to the space control capacity, which is adaptable for creation of complex models.

Polygon editing technique is developed on the basis of grids edition later, which is quite similar to the grids editing technique. It divides polygon into quadrilateral surface, in fact, it is same to editing grids in operation, just the mode is changed into another one. New modifier editing polygons is added up during the process of 3DMAX7, further improve the efficiency of edition. Panel parameters for polygon edition and grids edition are identical mostly, while polygon edition is more adaptable to the construction of models, many functions of which have surpassed that of grids edition, therefore it has become a principal tool for modeling of polygon.

2.2. Patch modeling

Patch modeling is developed on the basis of polygons, but it is an independent model, which has solved the problems that polygonal surface is not adoptable to do flexible editing. We can use a way similar to edit BEZIER curve to edit curved surface. The principles of patch are same as that of spline curve, all of which belong to BEZIER mode, and they can change the curvature of patch by adjusting the control handle on the surface. The advantage of patch modeling is that there are fewer vertexes to be edited, and we can use less details to fabricate smooth surface as well as epidermal folds, which is applicable for creation of biological models.

There are two methods for patch modeling: one is sculpting method, which is to use the patch editing modifier to adjust sub-objective of the patch. A quadrilateral surface can be modeled by pulling nodal-point and adjusting the handle of nodal-point; another one is skinning method, that is, to draw out the basic wire-frame of model, and then move into its sub-object level to edit sub-object, at last, adding one curved surface modifier to be a three-dimensional model.

2.3. NURBS Modeling

NURBS is one type of modeling method based on the formulas of mathematical principles. It depends upon control node to adjust the surface curvature and automatically works out the surface accuracy, compared to patch modeling, NURBS can use fewer control points to reflect the same curve, but because curved surface reflection is decided by the algorithm of curved surface, in addition to relatively higher curve function, the requirements on PC is the highest as well.

NURBS is a spline curve as same as the curve, but NURBS is one type of non-consistent rational basic curve, in another words, it is a special spline curve so it is more convenient in control and more smooth in building the objects. NURBS can build a wide variety of curved objects in coordination with the operation of lofting, extrusion as well as turnery. Modeling of NURBS is particularly applicable to depict complex organic curved objects, to build complex biological surface as well as streamlined appearance of industrial products, such as automobile, animals, *etc.*, but not applicable to build regular machinery or architectural models. NURBS modeling concepts: firstly to build a number of NURBS curves, and then connect these curves to form the curved surface object. Or use NURBS building tools to modify some simple NURBS curved surfaces to produce more complex curved surface objects.

3. Super-realistic iPod Digital Models Building Method

3.1. Construction of surface models on ipod body

In the top view-port, build a plane model with length 240, " width" 145, segment of length and width as 1 on average, and then click the right key to collapse it into an editable polygon objective (Figure 1).
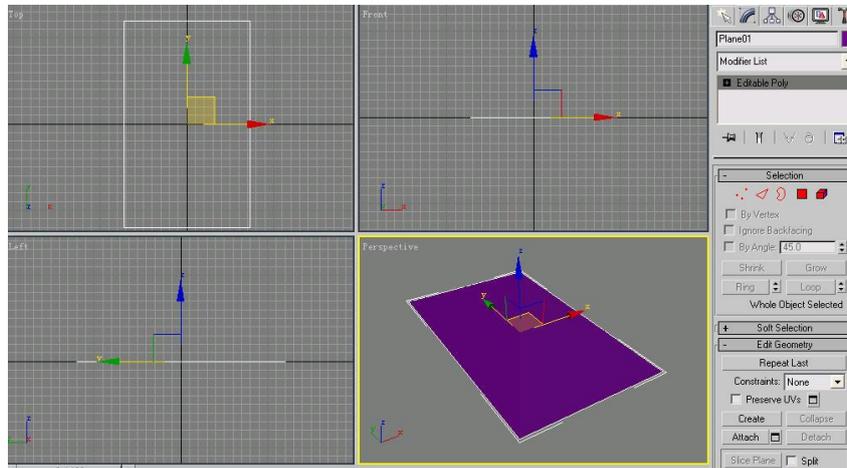

Figure 1. Build Plane

Upper surface of ipod is made up of screen and operation keys, for the purpose to accurgonately reflect both of units, it is needed to take the auxiliary objective as the reference. In the top view-port, build to a rectangle with a length of 84 and a width of 100 and use the align tools to align it horizontally with the plane, and building of screen below will take this rectangle as the reference.

Continue to build the reference figure for ipod operation keys. In the top view-port, build one polygon with " Radius" as 60 and "Side" as 8, and make it aligned horizontally with the plane, the final aligned effect is as shown in Figure 2.
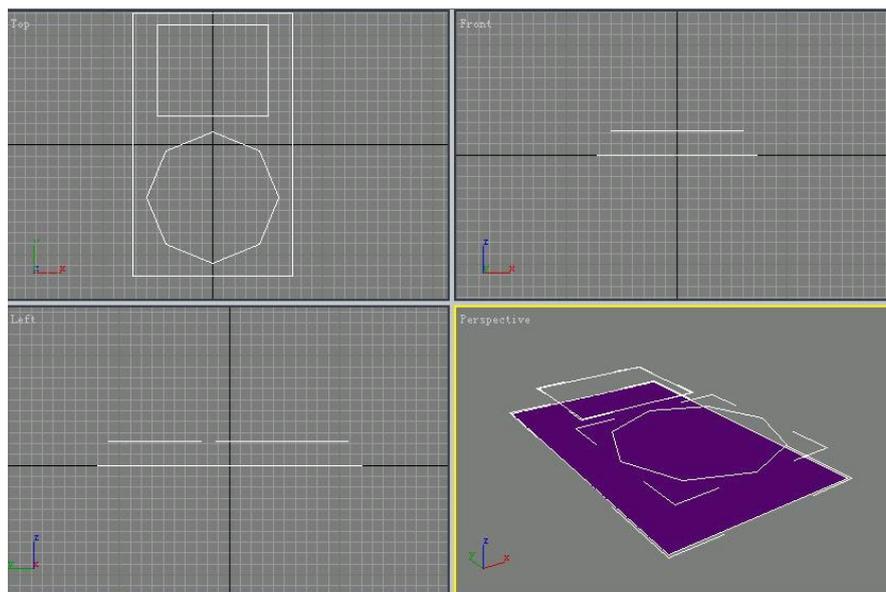

Figure 2. Build polygon

Move into modification panel and add one "Symmetry" modifier for the objective, a symmetrical model is produced as shown (Figure 3). Click right key to collapse this model into Editable polygon. For the purpose to keep the screen edges more straight in the following subdivision, we need to continue cutting, and re-cutting the edges as shown in Figure 4.
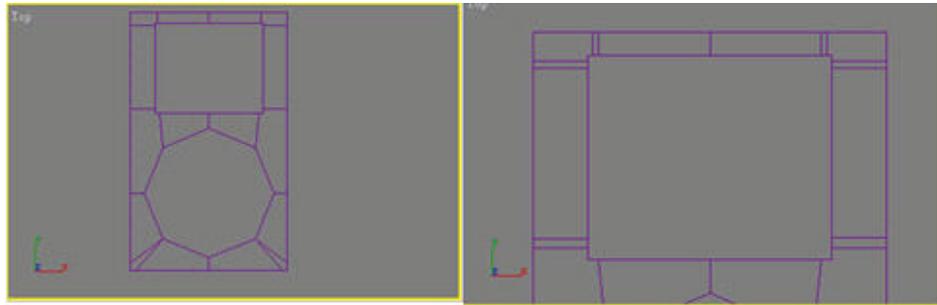

Figure 3. Exert symmetry   **Figure 4. Continue adding lines**

3.2. Production of screen

(1) Activate the sub-objective of "Border" and select the edge of screen, hold down the Shift key and move down the edge along Z-axis to extrude out polygon in the perspective view-port (Figure 5). Select the extruded polygon and click the Cap button in "Edit edge" panel to cap the edge into a polygon surface object (Figure 6)
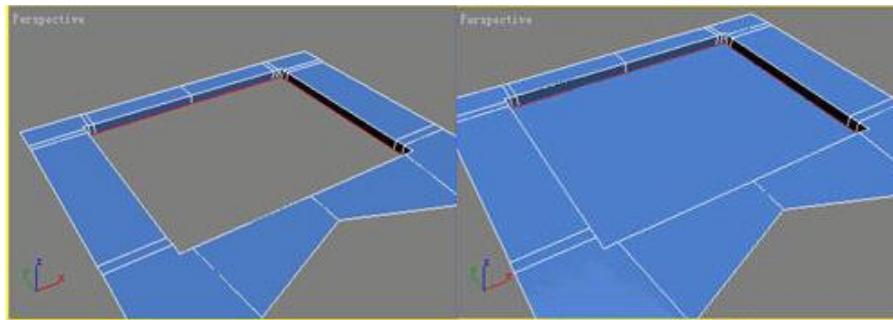
Figure 5. Copy edge   **Figure 6. Capping**

(2) Activate the sub-objective of "Polygon", select the polygon generated from capping, and click the "Detach" button in "Edit Geometry" panel and then directly click "OK" button in the dialog box, in this way, the screen and basic body can be separately operated. Select body model, and activate the sub-level "Edge" (Figure 7). And then click "Chamfer" button in the "Edit Edges" panel, set 0.25 in chamfer in the pop-up dialog box to take operation on the chamfer (Figure 8).
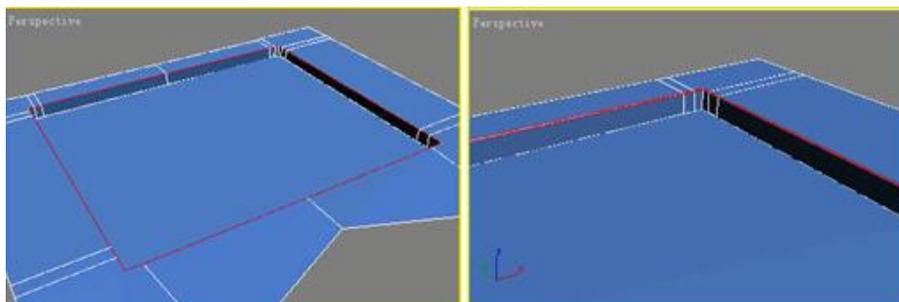

**Figure 7. Select edges**   **Figure 8. Completed chamfer**

3.3. Production of operation keys

(1) Activate the sub-objective of "Border", and select the border of operation keys (Figure 9) And then unfold display column, click " Extrude" the right dialogue box on the button, setting -7 in the pop-up dialogue box and click Apply button. And then click Apply button one by one, respectively set the extrusion volume 0.5,7,-12 and -7, at last click " OK" button to operate extrusion on the border (Figure 10).
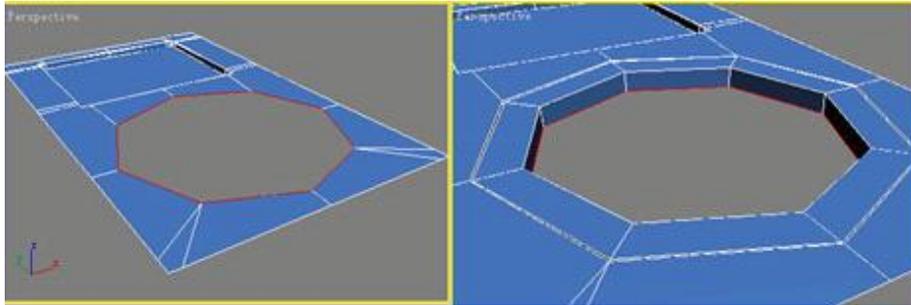

Figure 9.Select border of operation keys   Figure 10. Extrude edge

Play key is not completely enclosed, bottom of which is hollow, so we need to seal out the bottom. Activate the sub-level of "Border", select the edge of bottom, in coordination of Shift key on the keyboard, to zoom and reproduce the edge (Figure 11). Re-activate the sub-level "Vertex", and weld all the vertexes of inner border to that of outer border, and then seal the player (Figure 12).
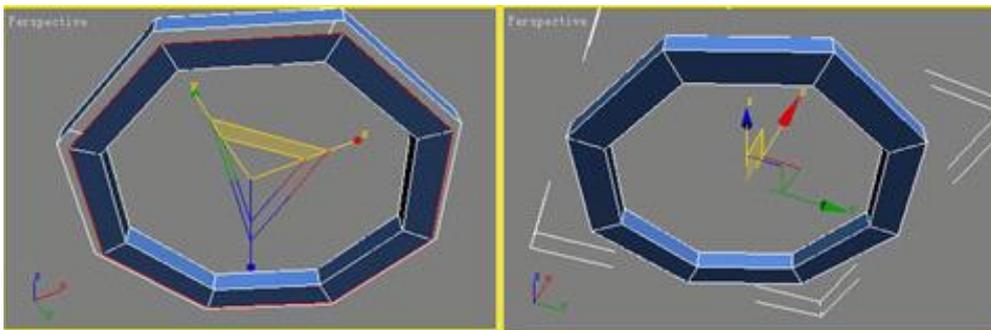
Figure 11. Zoom border   Figure 12. Merger-point

Select an edge on the lower surface, click the right dialogue box on "Chamfer" button, setting tangent angle to 0.1, to chamfer the edge so as to add up more details of models. And then close the sub-level of "Edge", select the checkbox of "Use NURMS Subdivision" in "Subdivision Surface" rollout, setting " Iterations" to 3,at this moment, the surface of model has become extremely smooth (Figure 13).
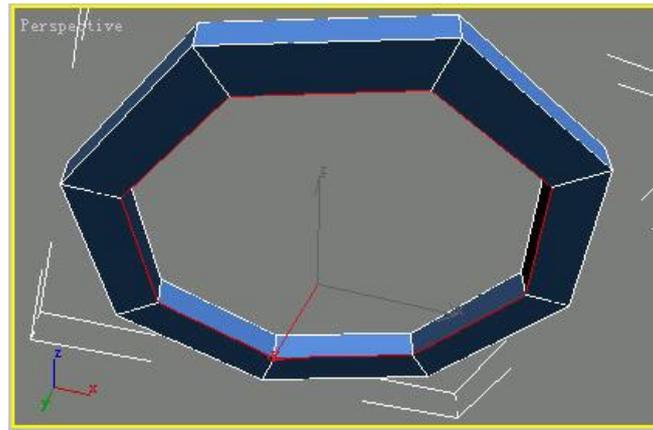
Figure 13. Select edge

3.4. Body cover production

In the perspective view-port, Right-click and select the order of "Unhide All" in the pop-out shortcut menu, to display all the objectives. And then right-click body model in the perspective, select the order of "Hide Unselected" in the pop-out shortcut menu, so that body model is only shown in the view-port (Figure 14).

Activate the sub-level " Border", select the outer edge of body model, click " Extrude" button in "Edit Borders" rollout, in the pop-out dialogue box setting" Extrusion Height" as -15, click " Ok" button to do the operation of extrude on the edge (Figure 15).
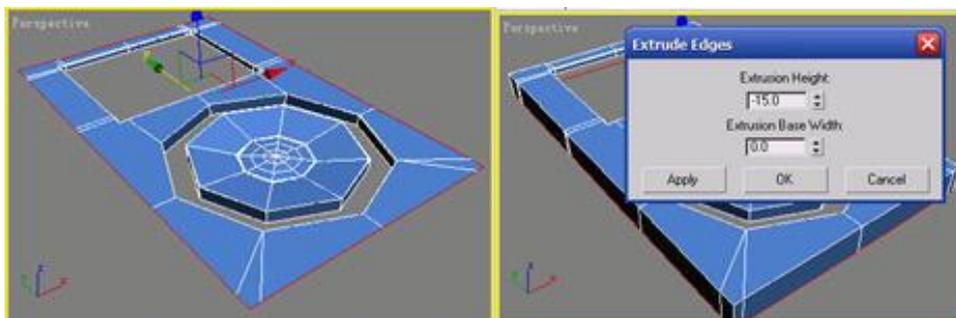

Figure 14. Select outer border   Figure 15. Extrude body border

Activate the sub-level "Edge", select any one of two middle edges to connect, click "Ring" button in the "Selection" rollout, selecting all the edges between two middle edges, and then click the right dialogue box on the "Connect" button in "Edit Edges" rollout, setting "Segments" as 2 in the pop-out dialogue box, click "Ok" button to end the operation (Figure 16).
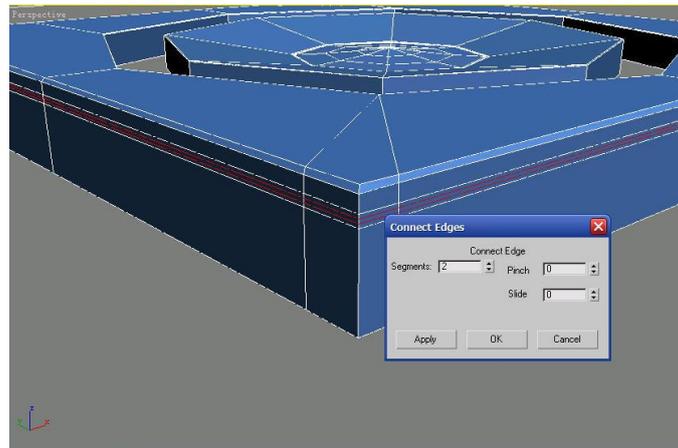
Figure 16. Connect edges

Activate the sub-level of "Polygon", select all the polygons between the two edges connected just now, and then click the right dialogue box on " Extrude" button in the " Edit Polygons" rollout, in the pop-out dialogue box setting "Extrusion Type" to be Local Normal mode, and then setting" Extrusion Height" value to be -4. Click " Ok" button to end the operation. Press Delete button to delete the polygons extruded out just now, due to differences of materials between upper part and lower part of ipod body. In this way, it can be divided into upper sub-objective and lower sub-objective (Figure 17) .
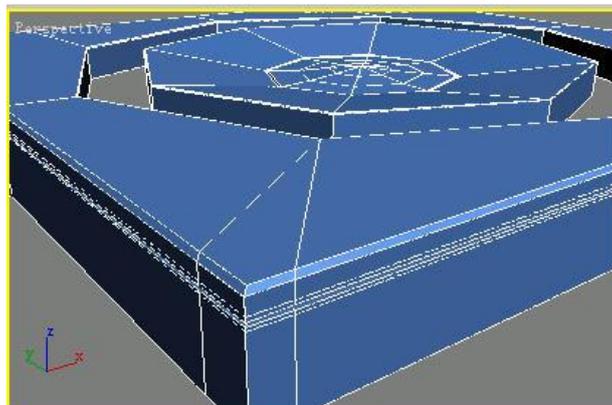

Figure 17. Extrude Polygons

Activate the sub-level of "Edge", and you will find that two middle edges have been automatically selected, click right dialogue box of " Chamfer" button, setting "Chamfer Amount" to 0.02 in the pop-out dialogue box to chamfer these two edges. The smaller Chamfer amount is, the smaller the fillet of border will be after subdivision of model (Figure 18).
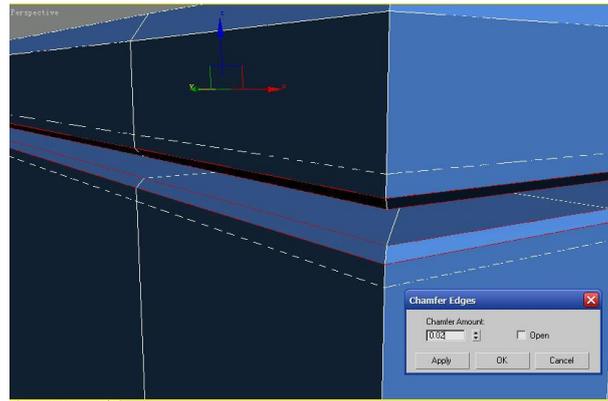
Figure 18. Chamfer edge

The following fabrication is located in headphone socket on the top of body. In the back view, create a Ngon reference figure with "Radius" as 4, "Sides" as 8 and place it in the location as shown in Figure 19. Select ipod body, and click "Cut" button in the rollout of " Edit Geometry" to cut according to the location of reference figure (Figure 20).
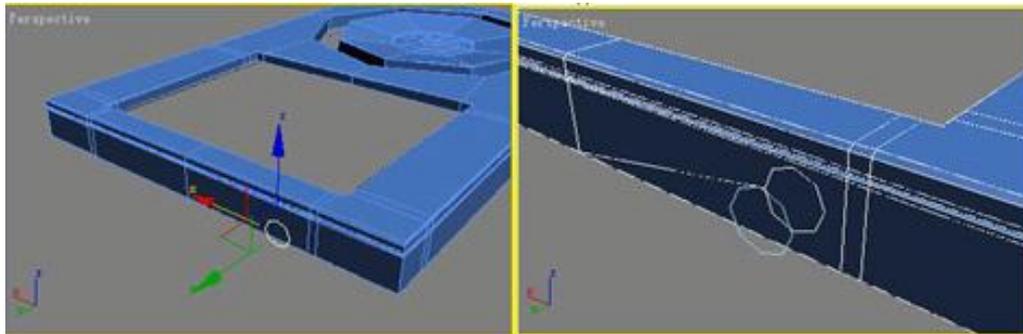
**Figure 19. Place polygons   Figure 20. Cut edge**

Activate the sub-level of " Border", and select the edge as shown in (Figure 21), in the perspective view-port, press Shift key to coordinate movable tool to complete the operation of copying the edges, applied for three times (Figure 22).
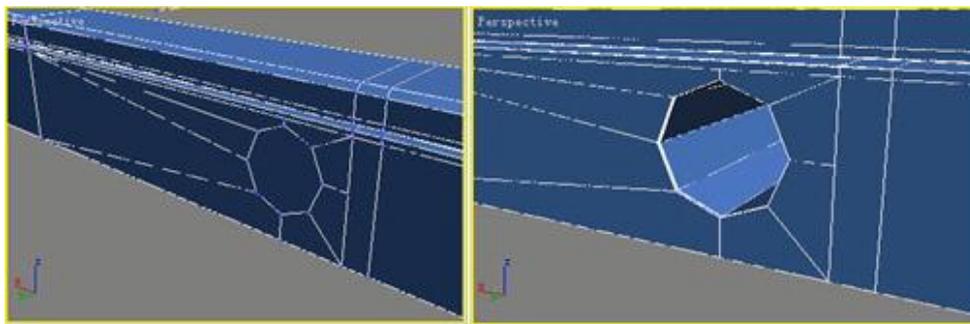
Figure 21. Continue cutting edges   Figure 22. Drag the edges

So far, ipod model part has been completely produced. Unhide all hidden objectives. The following step is to smooth the model surface. Move into the " Modification" panel of body, and select the check box of " Use NURMS Subdivision" in the rollout of "Subdivision Surface", setting " Iteration" to be 2. Finally, in the top view-port create a

plane as the desktop and place it below ipod model, the final effect figure is as shown in (Figure 23).
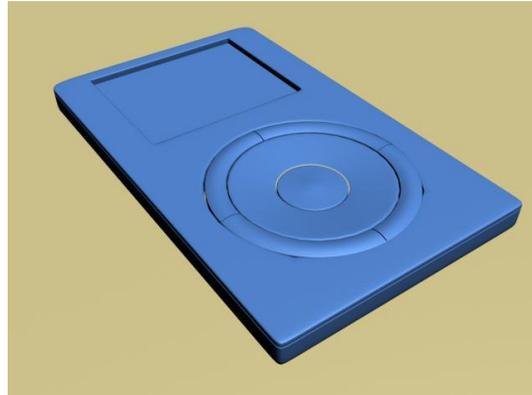
**Figure 23. Final effect figure**

3.5. In this section, we will make materials for an ipod model that has been completed and render it out

(1) Designate VRay renderer and based on the knowledge studied before, enable Skylight and GI lighting to coordinate rendering, setting the low-quality testing parameters. Rendering effect is shown in (Figure 24).

Figure 24. Skylight white model effect

(2) At first, designate one velvet material for the desktop, with material parameters as shown in Figure 23.
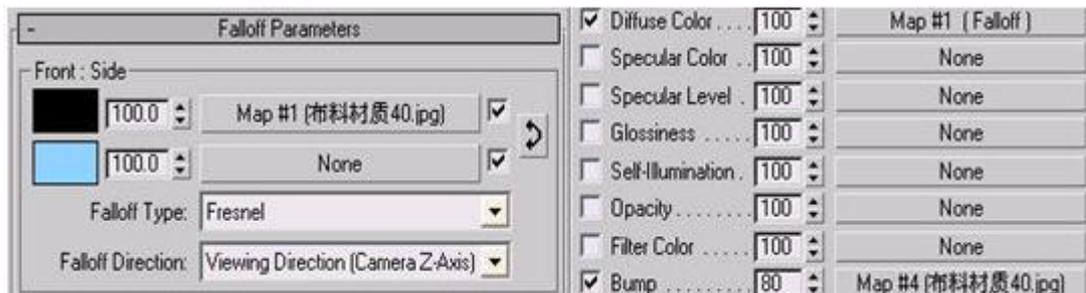
Figure 25. Materials quality parameters

(3) And then specify a matte metallic material for the body shell, next, we designate the materials for the screen, parameters of which are shown in Figure 26.
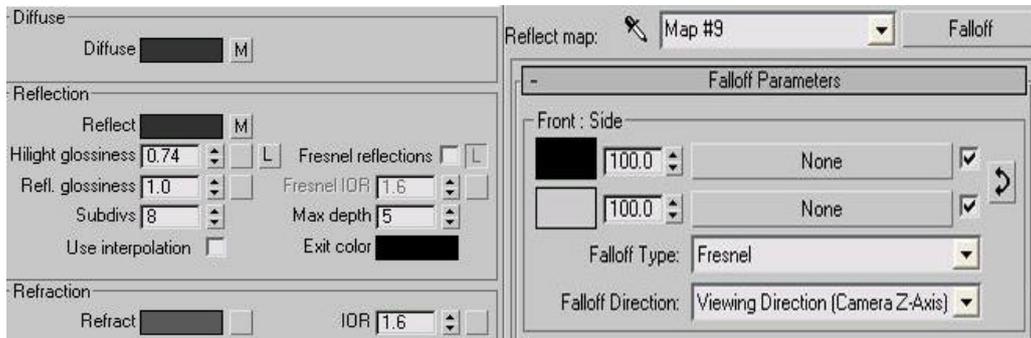

Figure 26. Screen materials

(4) Then we specify the material for the play button, we set it to be a beige painted material with parameter as shown in Figure 27.

For the purpose to keep the reflect of material to the environment more brightly, add one Output map in the channel of "Environment", setting " Output Amount" be 25.
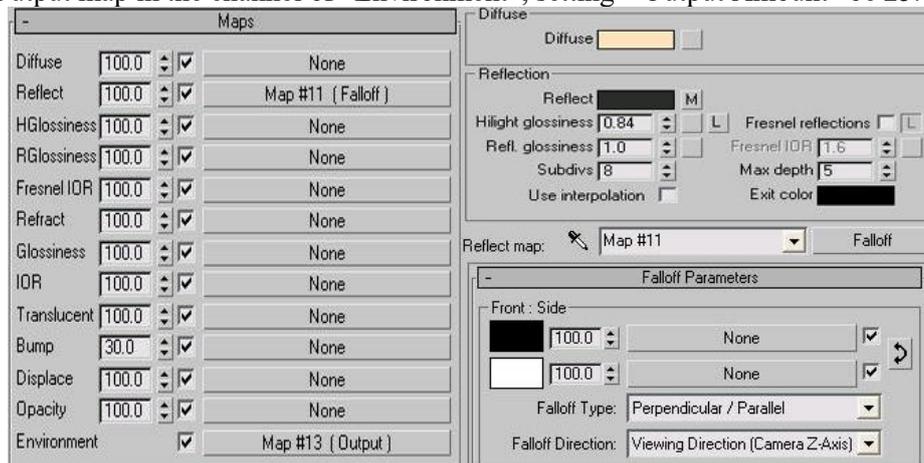

Figure 27. Play button materials

(5) After so many adjustments of material above, we test and render the scene with the effect as shown in Figure 28.

Figure 28. Test and render

(6) Finally, we produce some play buttons in the way of two-dimensional characters coordinating the extrusion modifier and put them on the top of play key. Eventually we enhance the rendering quality and complete the work of rendering on the finished products with the effect figure as shown in Figure 29.
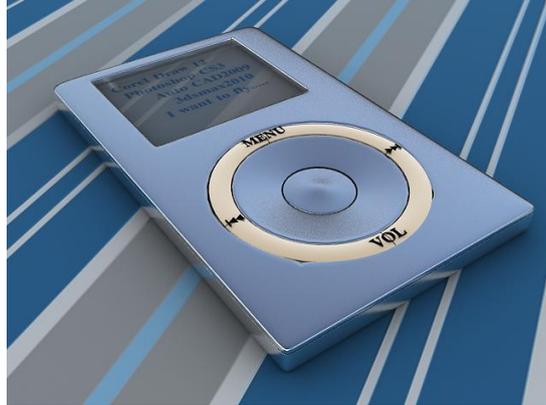
Figure 29.finally work effect

4. Conclusion

3DMAX software has been familiarized early at home and abroad with its advantages of strong function and simple operation and has become one of world's most popular three-dimensional design software, which plays an essential role in the design of computer effect chart. Strengthening the research on the process of production of 3Dmax virtual products and being well acquainted with the technology applied in modeling process will be of great significance for the improvement of product designer's modeling skill.

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