

The development of 3D Polygon serif style Kinetic typography for the Web

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Summary

This paper proposes the development of 3D polygon serif style Kinetic typography for the web with interaction. Kinetic typography on the Web is one of the current and decent information sharing technology. For creating effective 3D polygon serif style Kinetic typography, basic shape of serif style typography should be analyzed and created by shape, Bezier curve direction, and converting NURBS to Polygon. The analysis of basic serif style digital font is required that digital font has variable serif shape. The organic classification of Bezier curve direction and origin, and assembly is necessary. In addition to, less Polygon count number is required for Web3D. It is important to balance between proper object visualization and decreasing data. Comparing to Polygon count number and object shape, the proper data should be calculated. On the Web3D space, Kinetic factor is added with interaction.

Key words:

Web3D, Polygon, Rational B-spline, RSVP(Rapid Serial Visual Presentation), Kinetic typography

1. Introduction

The purpose of this project is to one of the proper development of 3D polygonal serif style Font for kinetic typography which is available in web. First of all, the main focus of this development in detail is proper conversion of 3D polygon modeling especially, when the part of serif font cap is changed to the 3D polygon. Secondly, proper data is needed during loading to variable 3D polygonal serif style typography. When it imported to web 3D environment, the low 3D polygon number are necessary. The final is to generate reaction with the user understanding movement. While interaction is occurred with making the most of its characteristics, the user can know what the exact information is. In Table. 1, the developer shows how the main work process is ordered.

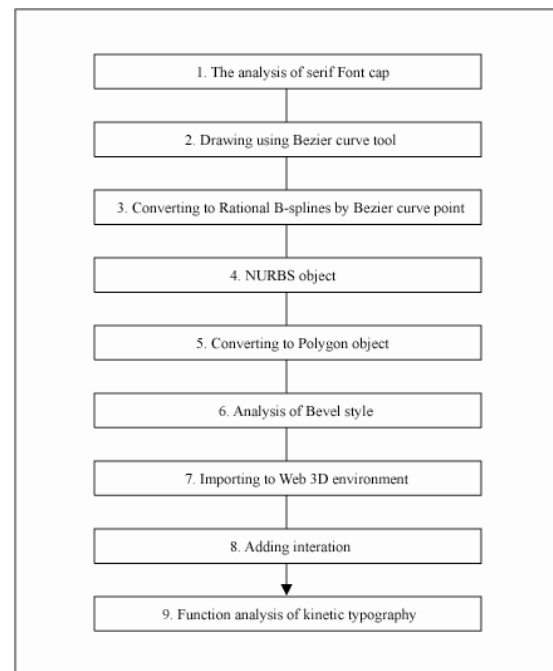


Table. 1 Project procedure table

2. Preparation and Procedure

To develop 3D polygon serif style Kinetic typography for the web, creating of the 3D web engine, converting to 3D polygon system, embodiment of kinetic typography, and understanding of RSVP(Rapid Serial Visual Presentation) are needed. The preparation required analysis of web 3D engine and fundamental cap form of serif font, cap drawing of serif font through Bezier curve, manufacture using Rational B-spline based on point of Bezier curve, modeling NURBS, analysis of Bevel style, export to web 3D, loading in web 3D circumstance, adding interaction, function as kinetic typography and these are proceeded gradually.

2-1. web3D(X3D)

X3D, the modular architecture produces layered profiles that can provide advanced functionality for immersive environments and enhanced interactivity, and focused data interchange formats for vertical market applications within a small downloadable footprint composed of modular blocks of functionality that can be easily understood and implemented by application and content developers[1].

A component-based architecture supports creation of different profiles which can be individually supported. Components can be individually extended or modified through adding new levels, or new components can be added to introduce new features, such as streaming. Through this mechanism, advancements of the specification can move quickly because development in one area doesn't slow the specification as a whole. Importantly, the conformance requirements for a particular piece of content are defined by indicating the profiles, components and levels required by that content.

2-2. 3D Polygonal Kinetic typography

Digital kinetic typography on the Web serves dynamic method of more information communication between the publisher and user than they do in traditional communication on the Web. Kinetic typography refers to the art and technique of expression with animated digital text. Similar to the study of traditional typography of designing static typographic forms, kinetic typography focuses on understanding the effect time has on the expression of text. Kinetic typography has demonstrated the ability to add significant emotive content and appeal to expressive text, allowing some of the qualities normally found in film and the spoken word to be added to static text. Kinetic type has been widely and successfully used in film as well as in television and computer-based advertising. Perceptual psychology research on attention, reading performance, and comprehension has indicated that time-based presentation of text can be used effectively to capture and manipulate a viewer's attention and in some cases improve overall reading performance [2].

2-3. RSVP(Rapid Serial Visual Presentation)

RSVP(Rapid Serial Visual Presentation), a theory related to the visual angle and discretion, is aimed that the composition reading of continuous word units is more convenient and faster than the composition reading of sentence units on the average. If people use the RSVP, the position of people's sight is changed continuously.

However, if we read a sentence which is marked by RSVP, the position of people's sight is fixed on one place. This indication method is so appropriate way when we mark typography in digital media. For instance, with no effect as to adjacent text, it is expressed by operating configuration like a word size from time to time, or showing text in small range relatively.

The classification of RSVP is the existing function in time, and it is used for actualizing the changing of one or more dimensions. For changing one of form dimensions, a dimension can use special value and external information or cannot use any. Continuance time is the time which is executed by a paragraph. There is a basic category for creating the paragraph[3].

- a. Sequence
- b. algorithmic generation
- c. alteration between Sequence and Algorithmic generation.

3. Application

3-1. Analysis of Basic shape of serif style digital font

Serif style Digital font family has variable caps which is curves. In Fig.3 and Fig.4, 2 basic serif style digital fonts show different cap style.

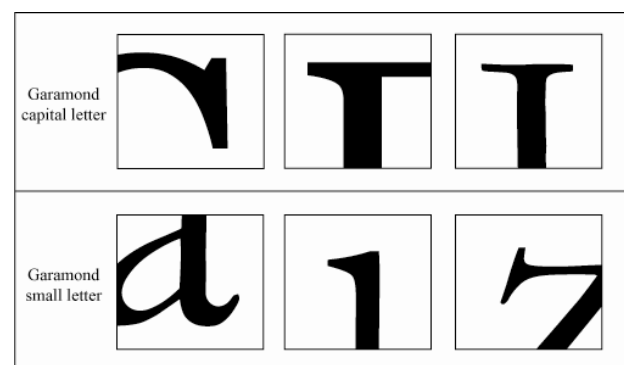


Fig. 1 Analysis of basic serif font-1.

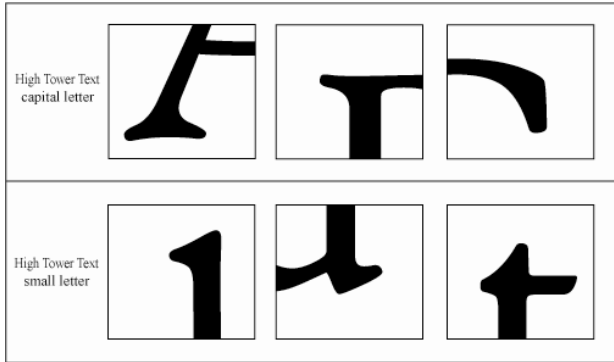


Fig. 2 Analysis of basic serif font-2.

3-2. Bezier curve and Rational B-spline

The Bezier curve point should be the index where new curve direction occurs. In Fig.3 Bezier curve point index data, the red spots shows to visualize the Bezier curve data. Bezier curve points are the parameters to measure Rational B-Spline.

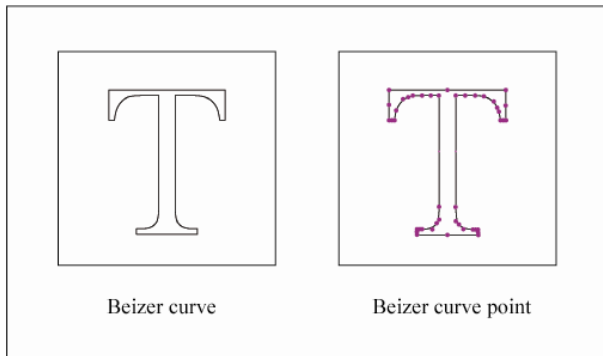


Fig. 3 Bezier curve point index data.

The Rational Bezier curve point settings for the adaption of NURBS object are described as[4]:

$$\mathbf{R}(u) = \left(\frac{x(u)}{z(u)}, \frac{y(u)}{z(u)} \right)$$

The 2D Bezier curve to 3D space as:

$$\mathbf{Q}(u) = \sum_{i=0}^3 \mathbf{P}_i B_i(u)$$

$$\mathbf{P}_i = (x_i, y_i, z_i)$$

As shown in Fig.4, variable function curve direction is designated as the curve is newly created. As Bezier curve

draws an arc to next index point, new curve direction should be created. Though all have different curve angles, the set of new generated curves, should play a role as one curve.

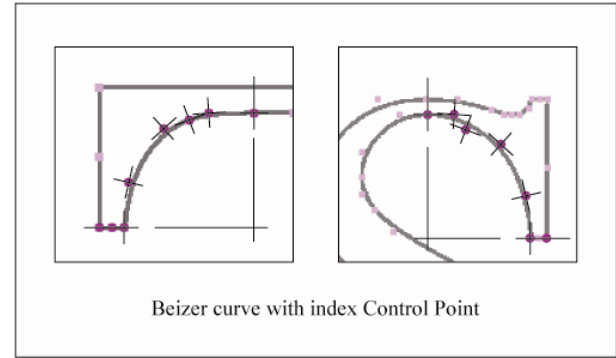


Fig. 4 Bezier curve direction data

3-3. NURBS based on Rational B-spline

NURBS(Non-Uniform Rational B-Splines) is the common 3D modeling method that easily mocks a curved 3D object. In addition, NURBS has modeling possibilities such as interactive placement and movement of control points, interactive placement and movement of knots, and interactive control of control point weights. Analyzing the basic shape of serif style font, the 2D shape is possible to draw using Rational Bezier curves. NURBS curves are defined as Rational Bezier curves between knots. In 3D environment, a ration B-spline curve is defined as[4]:

$$\mathbf{P}_i^w = (w_i x_i, w_i y_i, w_i z_i, w_i)$$

So the perspective map of such a curve in 3D environment is defined as:

$$\begin{aligned} \mathbf{R}(u) &= \mathbf{H} \left[\sum_{i=0}^n \mathbf{P}_i^w B_{i,k}(u) \right] \\ &= \frac{\sum_{i=0}^n \mathbf{P}_i^w B_{i,k}(u)}{\sum_{i=0}^n B_{i,k}(u)} \end{aligned}$$

Rational B-splines have the same analytical and geometric properties as non-rational B-splines and if:

$$w_i = 1 \text{ for all } i, \text{ then:}$$

$$R_{i,k}(u) = B_{i,k}(u)$$

As shown in Fig.5, 2 Rational B- splines project to 3D virtual space to make NURBS model.

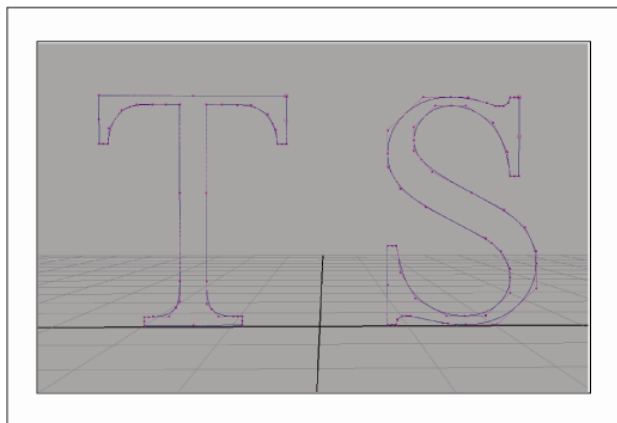


Fig. 5 Project to Rational B-splines in 3D space

3-4. converting NURBS to Polygon object

Basic shape of polygon is triangle. The convert method depends on polygon count related to tessellation. Of course, a 3D object with many polygons can display smooth rounded polygon shape. However, increasing polygon count can also cause increasing data. Indeed, the balance between abundant data amount and proper smooth rounded shape is also needed in polygon modeling. In Fig.6, variable polygon counts are applied for alphabet character S and T. Polygon object T, which have straight line is needed less polygon count, but when the user can understand that the object is type S, it can be noticed that the S shape can know more than 50 polygon counts.

Polycount	T	S
5		
10		
20		
50		
100		
200		
500		
1000		

Fig. 6 Polygon count of alphabet S and T

In Fig.7, comparing caps of serif Font, is needed more polygon count than Fig.6.

Polycount	T	S
5		
10		
20		
50		
100		
200		
500		
1000		

Fig. 7 Polygon count of alphabet S and T in detail

3-5. Analysis of Bevel style

The side of the polygon object has bevel. In Fig.8, convex out style bevels are applied for variable polygon objects. It is another element to define as Polygon object could be read as an alphabet.

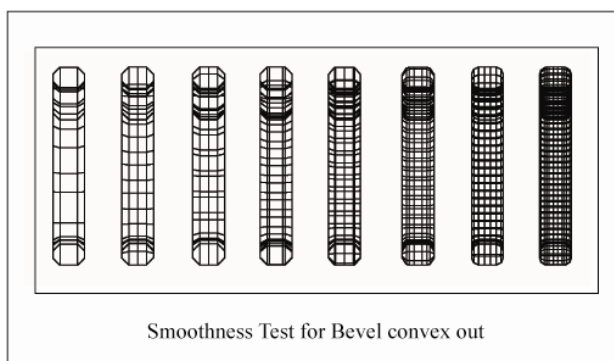


Fig. 8 Analysis of Bevel smoothness

3-6. Kinetic typography on web3D

When the Kinetic Typography runs on the Web, there should be ready in advance a definite description. In the other aspect, the word and time dimension should be confirmed to significant content in the process, and using these specific movements is important. In Fig.9, the importance is to recognize the form or location's alteration through Z axis as an object which is possible to operating and using in design process[4].

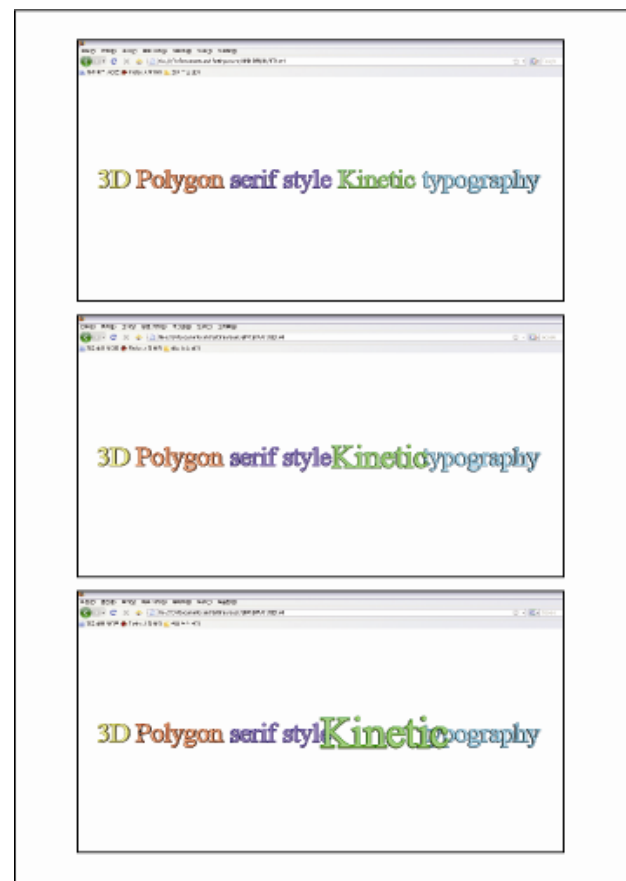


Fig. 9 Kinetic typography with interaction

4. Conclusion

Especially, serif style fonts usually consist of curved structure as it is possible to decorate, and in 2D space, it as a graphic image expressed using Bezier curve with function. During converting into 3D object, the main purpose of this development is to decrease Polygon count. Serif style digital font with few polygons has a fewer error when the developer consider to export the polygon object on the web later. In addition, it is mainly researched the

error correction whether the visualization has a problem or not as serif style font which is objected through web, 3D is operated with interaction and kinetic factors.

In conclusion, when setting up Index point of rational B-splines through Beizier curve as converting polygon and making polygon object again after drawing an appropriate shape and converting NURBS which have advantage over curved expression is made, it shows that the shape of proper subject is created with appropriate polygon count numbers. It also represents that using Kinetic typography on the web3D is caused any problem to control with interaction.

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