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Design and implementation of word editor for oracle: Bone inscription

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Abstract
The present condition and existent shortages of the oracle-bone inscription word editor are analyzed. A kind of new method of visual word editor for oracle-bone inscription is put forward. The functional structure of this editor is provided. The collect technical principle and implementation method of oracle-bone inscription word is introduced in the use of the proposed word editor. The visual word editor does not depend on the particular word database. One can easily and flexibly handle oracle-bone inscription characters using this new word editor. The visual word editor for oracle-bone inscription can be applied to operating system platform in English and Japanese and other language, and it has a very important practical significance for the research and spreading of the oracle-bone inscription characters.

Keywords: oracle, bone inscription, word editor, visual

1. Introduction

Oracle-bone inscription is ancient Chinese character text carved on the shells and animal bones used for practice divination, and it is the earliest mature Chinese character system discovered so far, has a very important position in the history of the development of Chinese characters [1-3]. With the development of computer technology, oracle-bone inscription information processing has become a new topic in the research, explanation and application.

In the computer editing and processing of oracle-bone inscription, one must solve a series of problems such as character set selection, organization of the text form, literal encoding and type setting. Since 1970's American California University professor Hongxiang Zhou using computer technology on oracle bones hanging together, with the characters of research, Chinese and foreign scholars have the gratifying achievement in the field of digital Oracle, representative research achievements is the establishment of the oracle-bone inscription character database and oracle-bone inscription full text database, especially the oracle-bone inscription character database, completely solve the computer editing, oracle-bone inscription character data and deal with the problem, provides great convenience for oracle-bone inscription character data publishing.

Oracle-bone inscription character database and oracle-bone inscription full text database are just the tip of the iceberg of the digitization for Oracle-bone inscription. In experimental investigation, we found that there are still many problems and shortcomings [4-5]. The biggest advantage of oracle-bone inscription character database is that one can use all the editing tools available under the Windows operation system. But different countries and regions have no unified encoding for oracle-bone inscription character, if the oracle-bone inscription character is not installed in the computer, all the relevant data will become unrecognizable. On the other hand, the character library is too expensive and not convenient for input for the inscriptions amateurs and inscriptions scholars, therefore, oracle-bone inscription word editor is necessary for the exchange in relevant literal data and research.

As for the oracle-bone inscription full text database, its biggest advantage is the digital results of previous studies using the computer technology, the digital new products to CD-ROM and Internet based, and one can cite and edit the relevant data easily with the help of these digital database by copying and pasting. But if the information is video or image data, the problem becomes more complex, for example, if one plans to take out the oracle-bone inscription characters on the rubbings and put in the document, he has to use more than one image processing tools. The process is not only cumbersome, and even the effect is not satisfactory. Based on the understanding of the above two aspects, we exploit the oracle-bone inscription word editor edited. The editor can flexibly handle characters without dependence on some specific character library, and it can be applied to operating system platform in English and Japanese and other language, and it has a very important practical significance for the research and spreading of the oracle-bone inscription characters.

2. Functional Structure of Oracle-Bone Inscription Word Editor

Visual oracle-bone inscription word editor is an image and text layout system, can edit general text and oracle-bone inscription characters. The system uses object oriented graphics rendering methods and visual character acquisition technology to achieve special editing function of oracle-bone inscription word. The system does not depend on the specific

character library. One can arbitrarily modify the characters in the editing process, because graphics processing technology is used in the system. Because there are not enough quantity sufficient word in the current character library, the fonts are not accurate, and the classification is incomplete, the word editor can also collect and edit the oracle-bone inscription word directly from the bone, rubbings and other pictures. The functional structure diagram is shown in Fig. 1, and it includes five modules as following.

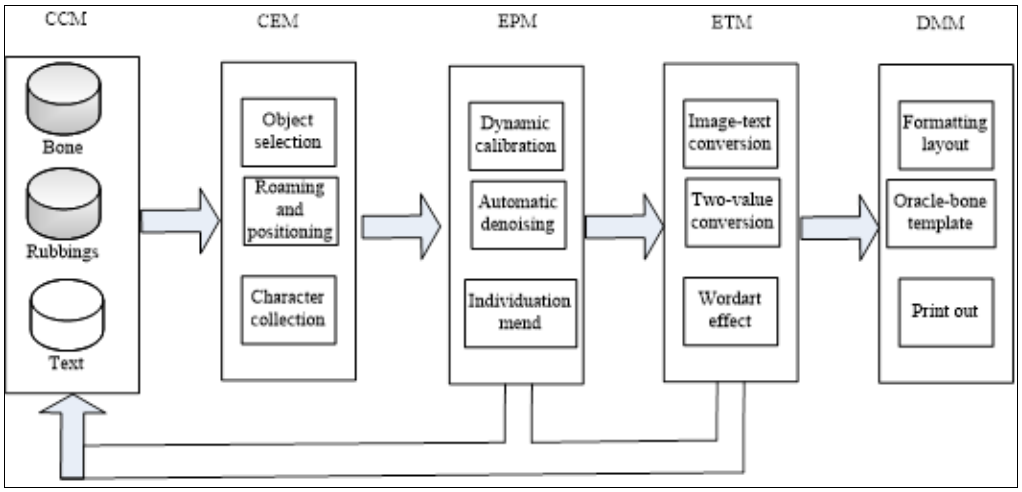

Fig 1: Functional structure diagram of oracle-bone inscription word editor

2.1 Character Collection Module (CCM)

It can realize the visual input of oracle-bone inscription word, and it completely solves the difficult question of input characters questions. It mainly completes two parts of functions, one is object selection, the other is mouse roaming and positioning. Object selection can select objects; visual input from the object manager within the object of visual input can be generic font text or oracle-bone inscription text. One can directly enter from the bone fragments and rubbings by digital equipment. The mouse positioning and positioning roaming input object, collecting characters of high demands on the mouse position from the oracle bone digital amplified, roaming positioning technology can solve the problem better.

2.2 Character Editing Module (CEM)

In this module, it uses graphics tools to collect the characters after editing, such as amplification, correction, rotation, flip, coloring and other operations. The current oracle-bone inscription character library is constructed by copy and drawing from the rubbings, and it needs further research to prove its correctness. This module provides a dynamic correction function for the existing oracle-bone inscription character, and it also can increase the annotation and explain in any text, sorted storing, help researchers form individual oracle-bone inscription database.

2.3 Effects Processing Module (EPM)

Special effects of oracle-bone inscriptions have a very important significance in the investigation and research of oracle-bone inscription annotation and calligraphy in this module. It can provide Image-text conversion, two-value conversion, and wordart effects functions, and also provides the classification and combination of characters and radicals, word function.

2.4 Editing and Typesetting Module (ETM)

This module provides processing tools of editing and typesetting layout similar to the way of general word. Due to the use of special technology, it can make the text layout more convenient and personalized, for example, horizontal, vertical, inverted, row. One can also realize the dynamic editing function of characters, that is, the structure, size and shape of the text can be modified immediately during the editing process. At the same time also provides several templates for oracle-bone inscriptions, and the learner of oracle-bone inscriptions can imitate on the template.

2.5 Database Management Module (DMM)

From the discovery of oracle-bone inscriptions, it past one hundred years up to now, and predecessors had left abundant research results to us. In order to facilitate academic exchanges and cooperation in the oracle bones, this editor provides a personalized oracle-bone inscriptions database, and each oracle-bone inscriptions scholar can edit characters. It can be stored in a personalized document the database. It provides a personalized platform for the study of oracle-bone inscriptions.

3. Design and Implementation

In the process of design and implementation of visual word editor for oracle-bone inscription, we employ the software development platform C++ Builder 6.0, because this software development platform has abundant visual VCL and has advantage in visual programming.

The general principle of text input method is that different fonts encoding select different input methods. Oracle-bone inscription word editor adds visual area of a variable size based on the traditional graphic editor. On the one hand, the user can enter the standard characters with the keyboard; on

the other hand, the mouse can be used to click the oracle in the visual area. After editing, the graphic file is used to save the editing results. The operation of the above process is divided into the following three steps.

Select or build visual objects. Scholars in the study of oracle-bone inscription processing, the source of oracle-bone inscription word has three aspects: the original characters of bone or rubbing, the oracle-bone inscription related documentation, and special oracle-bone inscription character library. In order to achieve visual input without relying on oracle-bone inscription character library, we have documented the oracle-bone inscription character library. In this way, the choice or establishment of visual input objects can be done in the following two ways:

1. Establish bone piece or rubbing the visual objects. Get the text directly from the oracle-bone slices. The method we choose is through the scanner directly to the bone or digital rubbings of oracle-bone inscription, this method is direct and reliable, and is one of the important functions of the editor. In addition, taking into account the possibility of oracle-bone inscription scholars can obtain information from the video data, the system also provides for digital cameras or other video document support.
2. Select existing visual objects. In the condition that scholars cannot get more oracle-bones and rubbings, they can grasp visual objects from the oracle-bone inscription database or from the Internet to choose the visual objects.

Collect text in the visual area with the mouse positioning method. To find the characters needed to input is called positioning. Because the search scope is small, and this method is easy to implement for oracle-bone or rubbings. But to achieve the visual retrieval from the thousands of characters, it is necessary to visualize the existing characters. We provide two kinds of visual processing method: one is called system processing, all of the characters in radical classification into a visual image file encoding in this way; the other is called personalized treatment, oracle-bone inscription scholars encode and generate visual documents based on their research needs. Retrieval method of visual object processing personalized defined by the user, the system automatically handles visualization object. We use the thumbnail image roaming location technology to search character from visual object. Thumbnail image roaming positioning technology, that is, in a larger image of the thumbnail, press the left mouse button to move the mouse in any direction, you can achieve the positioning of the larger image technology. This technique can solve the problem of visual localization of large images in oracle-bones inscription word editor. The C + + Builder program for vertical roaming positioning is given below.

Open the visual objects in Timage1, define global boolean variables: bool mouse-Down = false, and the procedures of three mouse events Mouse Down, Mouse Move and Mouse Up for thumbnail Timage2 object are as following:

```
Void-fastcallForm1: Image 2 Mouse Down (T Object *Sender, T Mouse Button, Shift State Shift, int X, int Y)
{
mouse Down =true;
down X =X;
down Y =Y;
//Save the position coordinates of the mouse click.
}

Void-fastcallTForm1:Image2MouseMove (TObject *Sender, T Shift State Shift, int X, int Y)
{ // The mouse is clicked and the position changed.
  If (mouse Down)
    {
int change Y =Y -downY; // Find the vertical distance of the mouse movement.
Image1 ->Top =Image1 ->Top +changeY;// Move the input object if (Image1 ->Top >0 Image1 ->Top <=-(Image1 ->Picture ->Height))
        {
        Show Message ("Beyond the boundaries of the image!"); Image1 ->Top =0 ;
        }
// Limits the moving range of the input object.
Void-fastcal lForm1::Image2MouseUp (TObject *Sender, T Mouse Button Button, TS hiftState Shift, int X, int Y)
{
mouseDown =false;
}
```

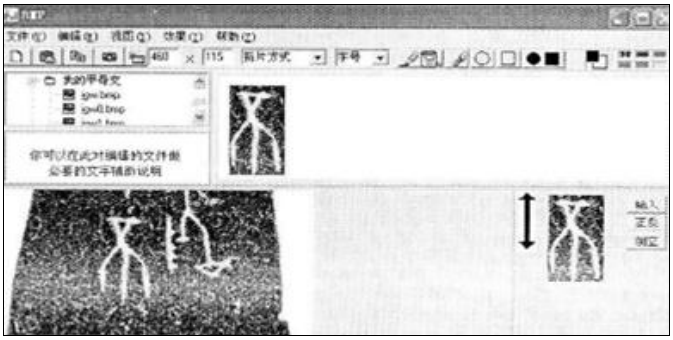

Fig 2: Character collection interface diagram of oracle-bone inscription word editor

Edit oracle-bone inscription character. One can input the oracle-bone inscription character directly selected from different media, and can also edit, then get normal text.

1) Automatic de-noising processing of character collection. The step can ensure the accuracy of the oracle-bone inscription character collection from the bone and the digital rubbings. If the characters samples get from bone or rubbing are fuzzy, text adhesion, overlapped, it will often make the text graphics have some bright spots and noise. De-noising processing is to remove these some bright spots and noise with different size distribution in the text. The method we adopted is that first edit the character and pretreat simply, and then change the threshold value in the binarization process. In this way we can automatically de-noise and maximize the accuracy of the collected text for oracle-bone inscription character samples. We can also set the same threshold value for the similar media, and batch process the collected characters. In this way, the efficiency of editing characters can be improved. The figures shown in fig.3 are several de-noising effects under different thresholds value.

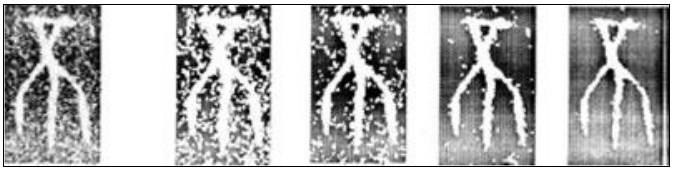

Fig 3: De-noising effects under different thresholds value

2) The process of text collection zoom, reduce, invert colors and turnover for collected characters. According to the need of editing environment, after positioning, collection, de-noising for the oracle-bone inscription characters, it needs to do further processing, such as zoom, invert colors and rotation, to achieve the requirements of editing. The procedure for this process is no longer given in this paper.

3) Design for special effect characters. Design of special effect for oracle-bone inscription characters is needed for check and interpretation. Because the oracle-bone inscription character is pictographic character, and the changes of its stroke shape, the position and direction of radicals are likely to inspire researchers. At the same time, special effect of oracle-bone inscription character is also necessary for its calligraphy. Fig. 4 is the special effect diagram of oracle-bone inscription characters collected directly from rubbings.

Fig 4: The special effect diagram of the oracle-bone inscription characters

4) Input and editing of the characters. The characters can be placed in any mouse pointer, and can also be put into the personalized document in graphic form after the above steps. In order to use it conveniently later, one can also annotate the paraphrase, sources and other information, and form the database of his own. The oracle-bone inscription characters in the personalized document and database can be generated after the visual input bar by the classification and reorganization. Click the visual input bar, the corresponding character can be input to the designated area, and it is shown in fig. 5.

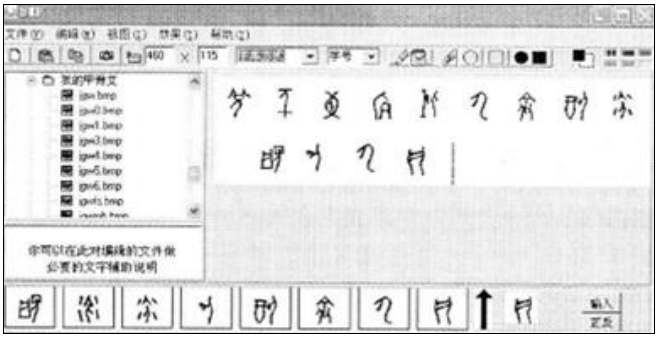

Fig 5: The visual input of oracle-bone inscription characters.

4. Conclusions

A new method of the editor for oracle-bone inscription character is created, and an exchange platform is provided for the scholars of the world. And a new way is proposed to edit and publish the oracle-bone inscription character data. The modified editor can also be used to edit Chinese bronze inscription, pottery inscription and other ancient inscription characters.

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6. References

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