

Research and Application of Collaborative Processing Technology for Graphics and Image Based on HTML5

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Abstract

Based on the above defects and the superiority of HTML5, the paper is aimed at realizing the process of graphics and image on Web by combining with graphics and image processing algorithm on computer at present. At the same time, the real-time graphics and image processing cooperatively by multiple personnel is also realized. Finally, a graphics and image processing platform on Web will be established which is easy to maintain, share, expand, being carried out in real time and iteratively. It is named as Web Photoshop. The platform is not only able to carry out graphics and image processing work on a single computer, but also used for graphics and image processing cooperatively by multiple personnel. At the same time, the subject also analyzes and discusses the possibility of graphics and image processing cooperatively by multiple personnel by comparing the effect of common graphics and image processing program on desktop. What is more, the HTML5 is used in trial in the subject to rapidly construct the graphics and image processing application based on mobile devices.

Keywords: *collaborative processing technology, graphics and image process, HTML5*

1. Introduction

Currently, the software we use on the computer is mostly desktop application program, such as Word, QQ and so on. The processing software for graphics and image is alike that application program which uses C/S architecture. The advantage of the architecture is fast processing speed, but because the algorithm and logic of the program are concentrated in the client terminal, it is difficult to make software maintenance. What is more, prior to using the software, each new user is required to deploy the computer environment firstly and then download and install the relevant software, which makes it complex for users. At the same time, the sharing of the software is relatively poor and it does not use the connectivity of network to the maximum extent, which is not conducive to process graphics and image cooperatively by multiple personnel.

The new Web standard appearing in recent years--HTML5 technology whose functions include: drawing, real-time communication, audio and video processing, offline storage and so on [1]. Canvas is the technology used for graphics processing in HTML5. It is equipped with a large number of methods of graphics processing. What is more, it has also innovated the Web Socket technology for graphics and image processing in the browser, so it is also the technology used for real-time communication in HTML5. It is the result of upgrading the common HTTP communication. Just relying on a Socket connection on Web, it will realize full duplex communication. For Web application which uses event-driving and requires the message to be upgraded in real time, it is able to provide a brand-new technology scheme.

Based on the above defects and the superiority of HTML5, the paper is aimed at realizing the process of graphics and image on Web by combining with graphics and

image processing algorithm on computer at present [2]. At the same time, the real-time graphics and image processing cooperatively by multiple personnel is also realized. Finally, a graphics and image processing platform on Web will be established which is easy to maintain, share, expand, being carried out in real time and iteratively. It is named as Web Photoshop. The platform is not only able to carry out graphics and image processing work on a single computer, but also used for graphics and image processing cooperatively by multiple personnel. At the same time, the subject also analyzes and discusses the possibility of graphics and image processing cooperatively by multiple personnel by comparing the effect of common graphics and image processing program on desktop. What is more, the HTML5 are used in trial in the subject to rapidly construct the graphics and image processing application based on mobile devices.

2. The Design of Collaborative Processing Technology for Graphics and Image on Web

2.1. Analysis of Demands

The users of the system are: users who need to carry out simple graphics drawing and image processing, those who are more indented to use Web program which is precise and easy to operate to solve the problems related to image processing and those who would like to cooperate with others in terms of processing graphics and image.

In order to make the operation of users be transformed smoothly from the traditional C/S desk program to the newly emerged Web program, the paper makes sufficient research on Photoshop, paint.net, Microsoft graphics board and so on when carrying out demand research so that the Web program will realize all the functions of them and be similar to the interface of them.

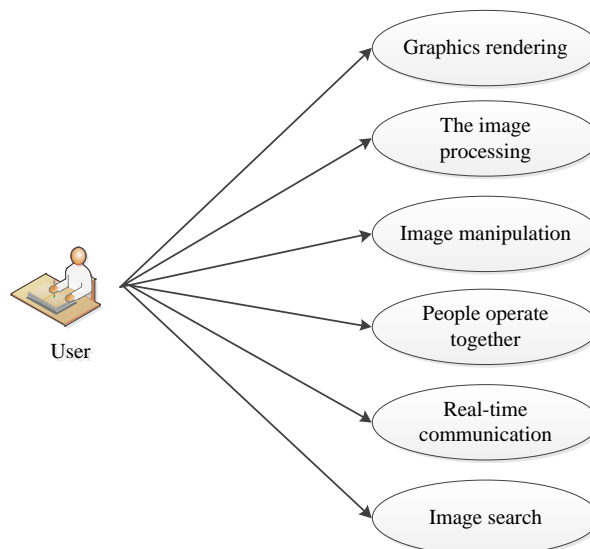


Figure 1. Overall System Use Case Diagram

The constraint conditions of the system are as the following content:

(1) The browser of the users can support HTML5 function, especially the canvas and web socket functions.

(2) When the system is deployed to the server, the computers of the users are required to access to the server by browser.

(3) The administrator of the server is able to control Web Photoshop server and the cooperative process functions.

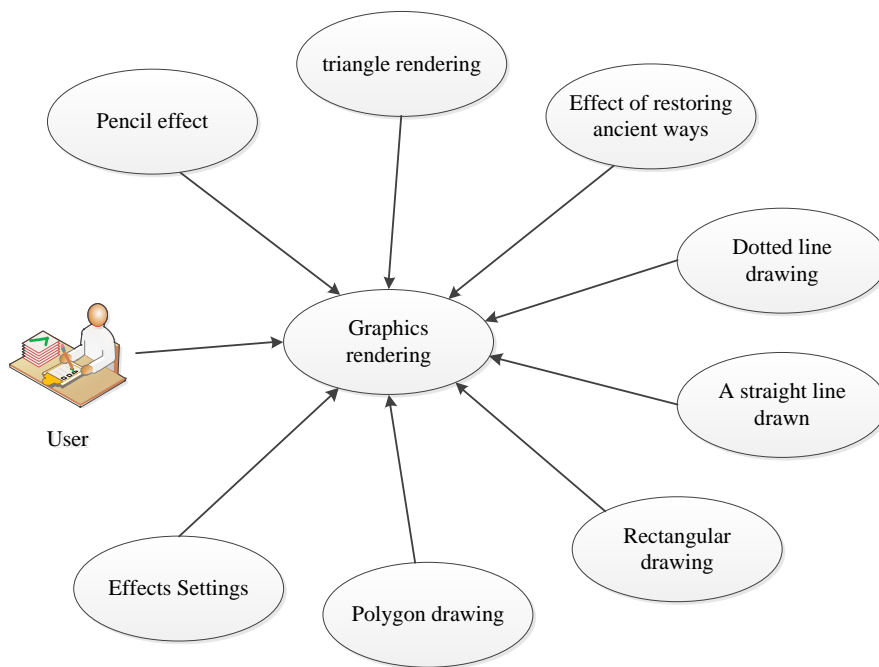


Figure 2. Graphics Use Case Diagram

2.2. Demand of Functions

The drawing, processing, transforming, filter processing of graphics and image and some other operations can be carried out on the browser, at the same time, it should also be able to support cooperative online processing of graphics and image by multiple personnel and real time communication of them [3]. It is able to import pictures, save the pictures to the local storage disc or server. It is able to retrieve and re-import the image operated previously for re-edition. The interface is pretty and the skin of it is changeable. The functions are easy to operate. What is more, it is also equipped with all kinds of auxiliary drawing tools. In the drawing process, the auxiliary lines and background mesh of canvas can be displayed according to the actual demands.

Try to use HTML5 to carry out drawing of graphics on the mobile devices, especially the ones with Android system. The main functions are: graphics rendering, image processing, and image manipulation, cooperative operation of image by multiple users, real-time communication, and image search.

The case diagram used in the system is as Figure 1:

3. Design of Functions

3.1. Graphics Processing

(1) Description of demand

On canvas, the drawing effect of pencil and brush can be realized, the drawing of straight line, a variety of dotted lines and curves is realized, the drawing of Nan circle, circle, rectangle, rounded rectangle, H angle shape , right H angle shape, isosceles triangle, polygon can also be realized, as well as some filling drawings of them. In the drawing process, the colors can be selected and there are two ways for color selection: one is that: on the color plate, the color selection is made or the corresponding values are input; the other is that on the color plate, color picker is implemented. It is able to fill the canvas with colors, that is to say, after selecting the area, the color selected can be used to fill out

the selected and closed area. The size, opacity, writing style, fuzzy degree, and line style is also optional.

(2) Case description (refer to Figure 2).

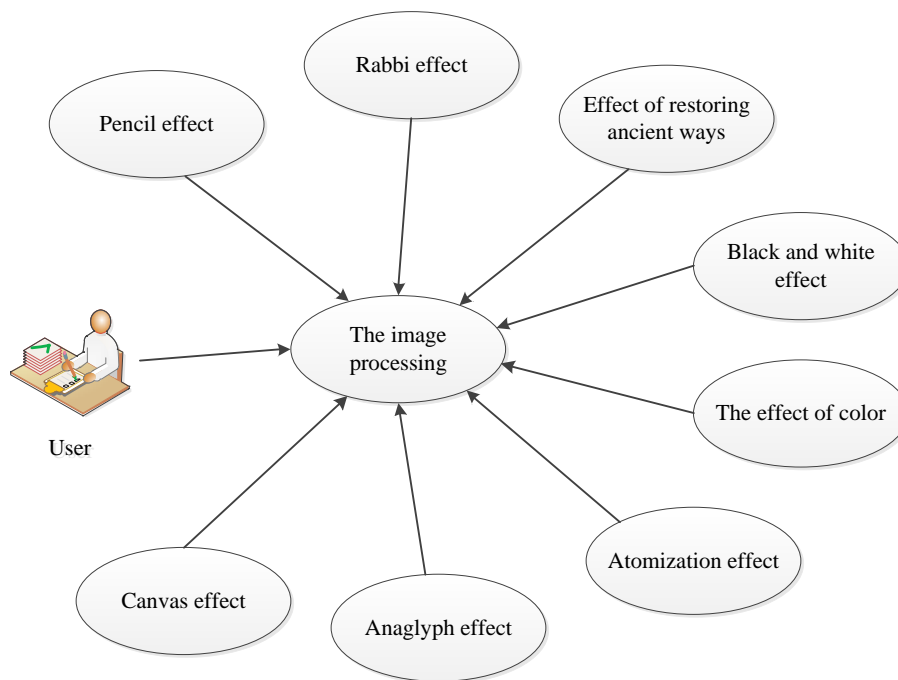


Figure 3. The Image Processing Use Case Diagram

3.2. Image Processing

(1) Demand description

It is able to input pictures including inputting the pictures in the local disc, selecting the pictures from the local folder and pull the pictures directly into the system and selecting the pictures on the server. What is more, the photos shot by the local camera will be obtained with filter processing for the photos being made. The effect which can be realized include: paintings, black and white, invert color, sharpening, softening, automation, blocks, cameo, blurring, carving, nostalgia, brightness/contrast adjustment, mask processing which further includes: red mask, blue mask and green mask.

(2) Case description (refer to Figure 3)

3.3. Image Operation

(1) Demand description

The operations that are implemented for image include: selection of image including region selection and object selection. Image movement: that is to move the selected area or the object/ image clipping includes rectangular clipping (reserved in clipping area, reserve outside the clipping area) [5]. The rotating of image: that is to say the canvas or the object within the selected area can be rotated by 90 degree to the right, to the left, 180 degree, vertical rotating, horizontal rotation and rotation by any degree. The effect of erase: it is able to erase the graphics drawn. The function of zooming in and out of graphics can realize the regional zooming in of graphics for view and the overall zooming in and out of graphics. If the text is inserted in any position of the graphics, the color, typeface, size of it can be changed. The overstriking, tilting, underline and strikethrough of the text can be made. The graphics will be saved as photos which will be saved in server. It is also able to save the image as the other formats. The graphics will be saved as

formats which make them possible for editing the next time. It is able to realize multiple layer management including the new layer, deleted layer and the changing of layer position.

(2) Case description (refer to Figure 4).

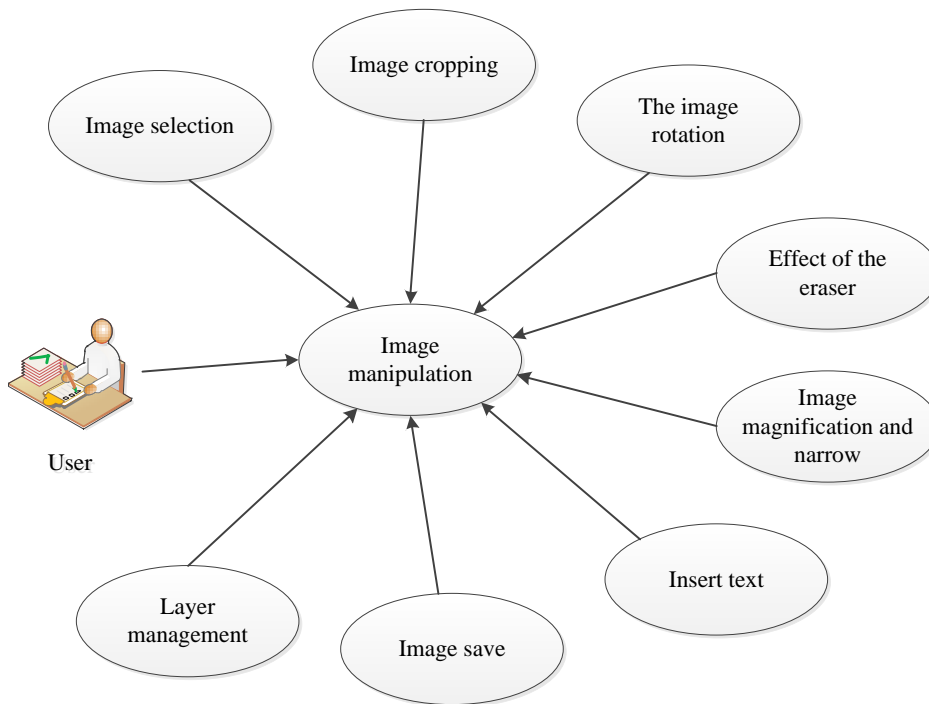


Figure 4. Image Manipulation Use Case Diagram

3.4 Cooperative Operation of Image by Multiple Users

(1) Demand description

The users are able to log in to the system and the users who participate in cooperative operation can draw and process image cooperatively online.

(2) Case description (refer to Figure 5)

3.5. Real-time Communication

(1) Demand description

In the process of cooperative operation of image by multiple users, the users who participate in cooperative operation can communication by text, which means that they can send and receive words, facial expression, photos. It is also demanded that they can communicate by audio and video, send screenshot, vibrating window, sending and receiving files. They are also able to request to get the location of the opposite side. When they are permitted to get it, the location will be displayed on map. In the communication process, communication between multiple users is also possible, as well as communication one on one.

(2) Case description (refer to Figure 6).



Figure 5. Many Collaborative Operation Image Use Case Diagram

3.6. Image Search

(1) Demand description •

The users are able to search the photos on the server by the names of them, and then they can load the pictures into the system by clicking it for edition of pictures.

(2) Case description (refer to Figure 7)

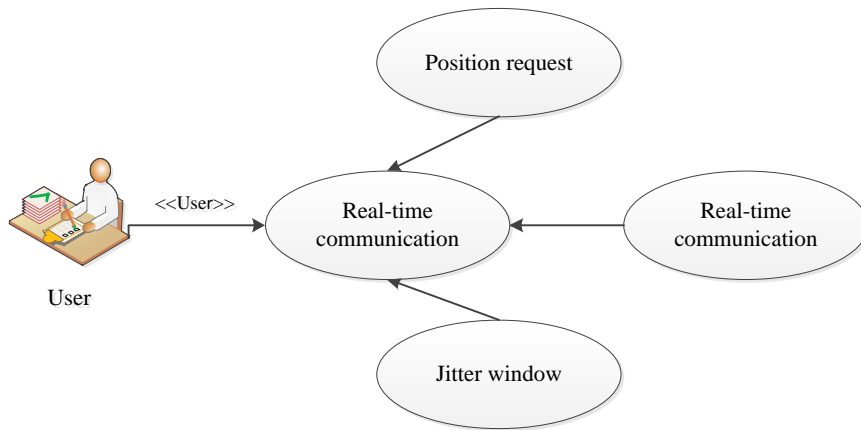


Figure 6. Real-Time Communication Use Case Diagram

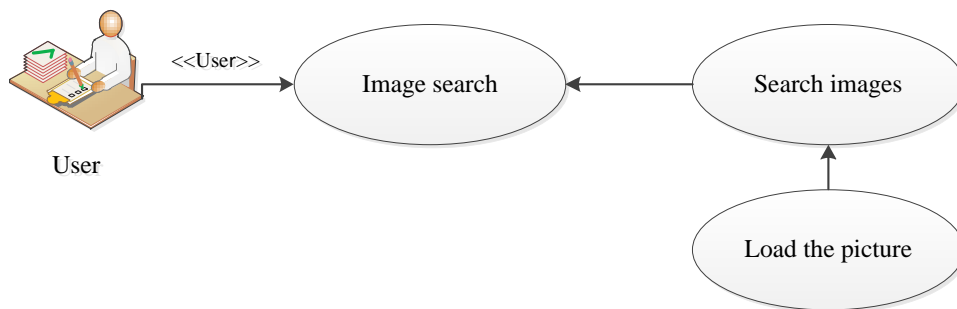


Figure 7. Real-Time Communication Use Case Diagram

4. The Realization of Functions of System Core

4.1. The Realization of the Core Functions in the Front

(1) The realization of the drawing area

The drawing area is actually the central area of the interface which is used for drawing graphics and processing images, at the same time, the management of multiple layers and the display of grids are also in this area. The canvas elements are used as the main elements for displaying of graphics and images, layers and grids. It includes the grid layer, temporary canvas layer, display canvas layer. Each layer has a canvas element. Their order of up and down will be set up by setting up their z-index, as shown in Figure 8.

Grid layer: it is used to display the grid lines of canvas.

Temporary canvas layer: it is used to display the trail of drawing process.

Display canvas layer: it is used to display the graphics drawn and the graphics and images processed.

Layer: it is the newly added layer. The overlapping of multiple layers will show an overall effect.

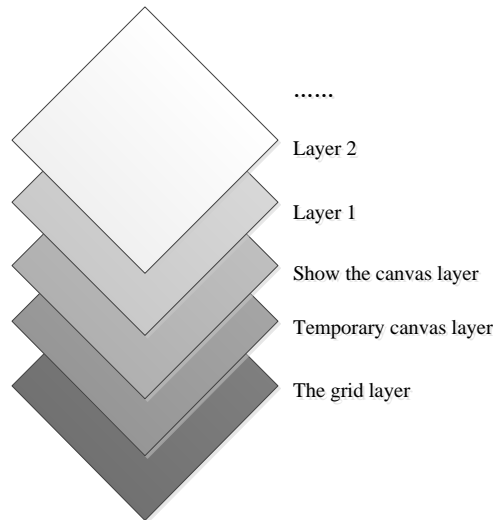


Figure 8. Draw Area Layer

(2) The realization of drawing function of drawing board

The canvas elements of HTML5 can be used to complete the drawing functions of drawing board. Firstly, the canvas is defined in the web page, and then JavaScript is used to call the function of canvas so as to draw the graphics and process the image on round cloth. The codes which are used to define the canvas are show as the following content:

```
<canvas id="showcanvas"> //you browser does not support the canvas function! Please  
change your browser!
```

```
</canvas><canvas id="tempcanvas"></canvas>
```

In order to display the current drawing effect in real time when the mouse is drawing lines, rectangle, circle and other graphics, two canvases are defined. The one on the top is the temporary canvases which are used to display the real-time drawing effect of mouse when it is moving, that is to say, the drawing effect is formed according to the starting and terminal points of the mouse if the drawing operation is not finished, the mouse is not heightened and it is still moving. The one on the bottom is the display canvases which is used to display the final shape formed after the mouse is heightened. The graphics processed and to be displayed are also shown in the display canvases. If the browser does not support the functions of canvas, the screen will show that “your browser does not support the canvas function! please change your browser!”

(3) The realization of the function to load the pictures in local disc by dragging them.

The function to load the pictures in local disc by dragging them is to use `dataTransfer()` function of HTML5 for transmitting the file information from the local browser, and then it will obtain the list information of the local files. This is the way to obtain the pictures which are dragged into page area. According to the way, the pictures will be drawn on canvas. As the default processing of browser for pictures dragging is that the it will open the objects of dragging by W linkage, `preventDefault()` function is used to stop the default processing behavior of browser so as to open the pictures by drawing them.

(4) The realization of functions of selection tool

The realization of functions of selection tool: firstly, the area of picture where the mouse stays is obtained, the height and width, then `getImageData()` drawing number of HTML5 is used to load the height and width as parameters. The pixel of the selected rectangular area is obtained, then the layer will created where pixel obtained is put in the new layer by adopting the `putImageData()` function of HTML5, at the same time, the original pixel of the selected rectangular area is cleared out. `PutImageData()` is able to endow the object with the removable features and then the newly-established layer will be endowed with the functions of mobile page elements. Finally, the mouse will be used to realize layer movement.

4.2. The Realization of Mobile Application

A simple trial is made for graphics drawing application which can be used on mobile devices. It is actually an application which can be used on Android system. The core code is still the code used for processing graphics and images on Web, but it is a simplified one, as only the drawing functions of a variety of graphics, the selection of color and the size of the lines are extracted so as to realize the graphics drawing on Android system where the shape, color and size of lines of the graphics are optional. If the code of graphics and image processing on Web is used on mobile devices, the only thing that is required is the mouse event of the original browser should be revised as the touch-screen event of the mobile event. That is to say, the three events involved in the original graphics drawing: clicking event of mouse, the movement event of mouse, the lifting event of mouse are revised as: touch event of fingers, the movement event of fingers and the lifting event of fingers. What is more, the acquisition of the current coordinate is changed to that of the finger coordinate. Other codes are not revised basically.

5. System Test, Operation Case, Analysis and Comparison of Results

5.1 Functional Test

The users' terminal does not have any requirement for system performance. The browser is required to support the HTML5 function, mainly the graphics drawing and communication function of HTML5. In the subject, IE 10 is used for development and tests.

Web Photoshop mainly tests the following functional models:

(1) Graphics drawing: on canvas, it mainly tests whether a variety of tools can be used to draw graphics and the color, line thickness, transparency, ambiguity and other attributes of the graphics can be set up or not. After the test, it is possible for a variety of tools to be used for drawing graphics and the attributes of the graphics can be set up as well.

(2) Image processing: it will test whether the local pictures and dragged pictures can be imported to the drawing board or not; whether the pictures in server can be opened or not and whether the pictures can be obtained from the camera. After the pictures are imported, it will also test whether it is possible for them imported or on the drawing board to be processed by filter or not. After the test, the pictures can be imported by four means and filtering process for graphics and images is possible as well.

(3) Image operation: it tests whether various shift operation can be made for image. It mainly includes rotation to various directions. After the test, the shift operation is possible.

(4) Cooperative operation: it tests whether the online users can process the graphics and images cooperatively. After the test, this kind of operation is possible.

(5) Real time communication: it tests whether the online users can make information communication or not. After the test, real time communication is possible.

(6) Drawing on mobile devices: it tests whether it is possible to make simple graphics drawing on Android devices. After the test, it is possible to make it. What is more, it is also able to select the object of drawing, the color and thickness of lines.

5.2. Some Examples of Effect Processing

The Figure 9-12 displays the final effect of the same picture which has been processed by fuzzy effect processing, relief effect processing, anti-color effect processing, and black-white effect processing with the Web Photoshop being adopted.



Figure 9. The Original Picture



Figure 10. The Effect of Wax Crayon

6. Conclusion

The paper only makes a preliminary discussion and experiment for processing diagrams and images W by HTML5 and cooperative processing of diagrams and images. The paper has made a platform for cooperative processing of diagrams and images where the ordinary diagrams and image, W, and cooperative processing of diagrams and image can be processed. It also tries to draw diagrams on the mobile devices of Android system, at the same time, from theoretical analysis, the paper concludes that there are many advantages for processing diagrams and image by HTML5 compared to the traditional way of processing diagrams and image in terms of realization of technology and performance.



Figure 11. Sketch Effect



Figure 12. Retro Effects

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