Image Completion Platform Implementation Instructions

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When EXE file is opened (probably can only be opened in Windows, 64 bits), the platform looks like below:

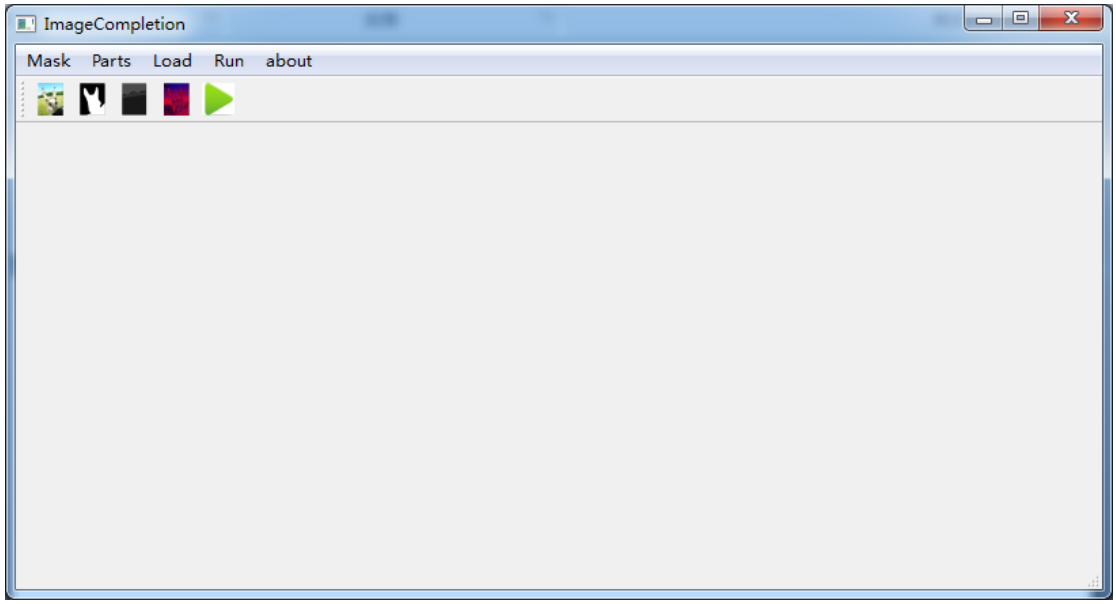

Figure 1 Platform

The following image will be used as an example to introduce each functions. Our goal is to do image completion in ball-area.

Figure 2 Image to be healed

Before running image completion, original image, mask image, image that shows the segmentation are needed. Original image, ‘mask’ menu and ‘parts’ menu can be used to get mask image and segmentation image.

First, ‘Mask’ menu helps to generate mask image, which shows the area that is needed to be healed. Then by ‘Parts’ menu, original image will be divided into different parts, and a new image will be generated to represent the dividing result. This step greatly improves the inpainting quality. From the image, it is clear that original image could be divided into three parts that have different textures. The upper part is sky, the middle part is grass with dense texture, the bottom part is grass that is close to the camera. After running ‘Parts’ menu, a new image would appear to show the mapping from pixels to different parts. Finally, by loading those three images using ‘Load’menu, image completion will begin after pressing ‘Run’ button, a healed image will show up.

1 generate mask image

There is a ‘Mask’ menu on platform, which is used to make mask image that shows the area to be healed.

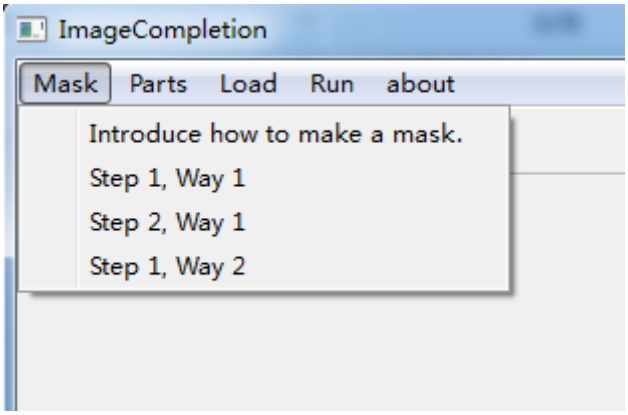

Figure 3 Mask menu

“Introduce how to make a mask”introduces the related functions and operation. Two ways to get mask are provided(Way 1 and Way2). Way 1 requires two steps while Way 2 requires only one step. Way 1 is complex and also needs help from other painting tools, but it can describe mask

in details. Way 2 gives user a way to directly draw curves as boundary of mask area but may not be so accurate. Both ways would generate a mask image.

First, we will introduce how to use Way 1 to get mask image. Press 'Step 1, Way1' in 'Mask' menu, a window will pop up as below

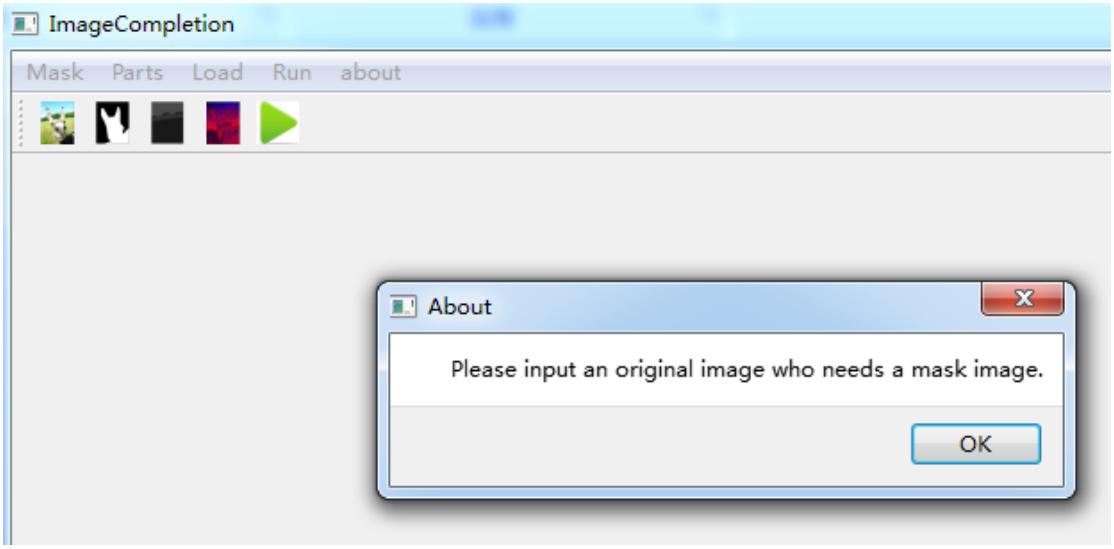

Figure 4 Read original image to make mask

By pressing 'OK', you can choose original image you want to open.

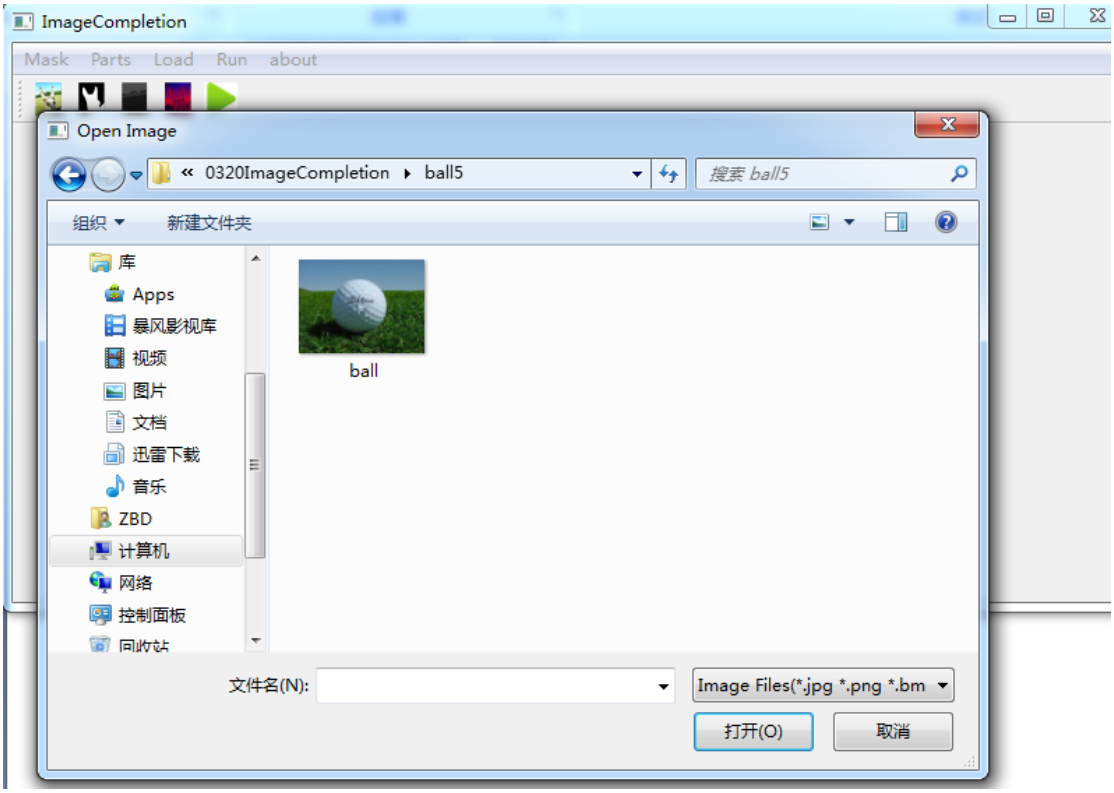

Figure 5 Read image

When it is opened, a window as below would show up.

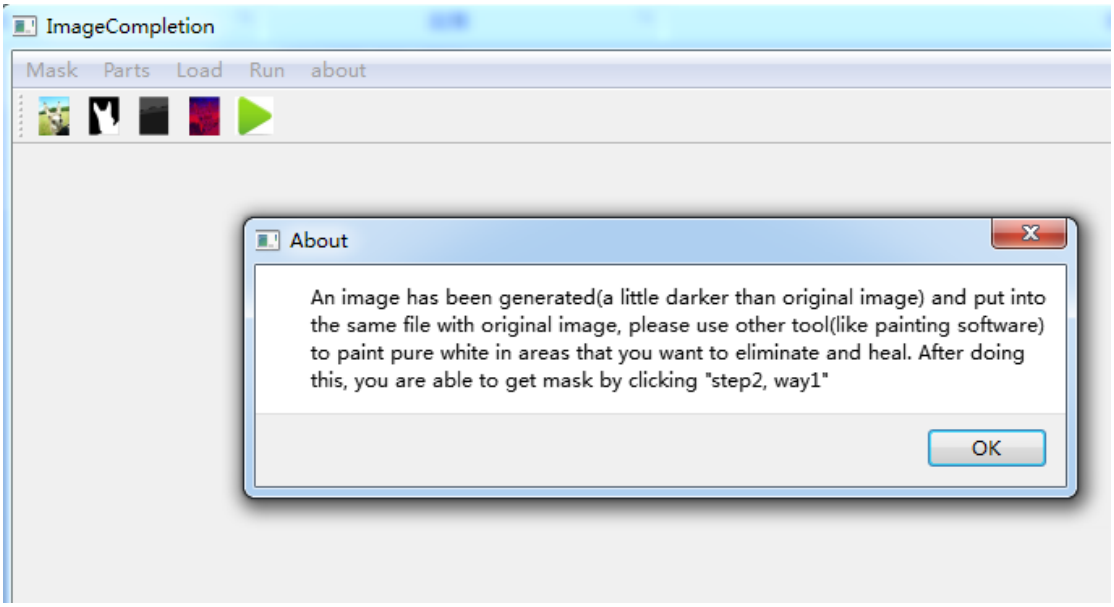

Figure 6 Complete the first step of making mask

In the same folder with original image, there would be a new image which is darker than original image but has same content as below.

Figure 7 Image generated after first step making mask

Then users are able to use normal painting tool to paint white color in areas that will be healed. The reason why this image is dark is that white color will be identified as inpainting area, pure white color in original image will also be treated as inpainting area if there is no such process. The image after painting is like below.

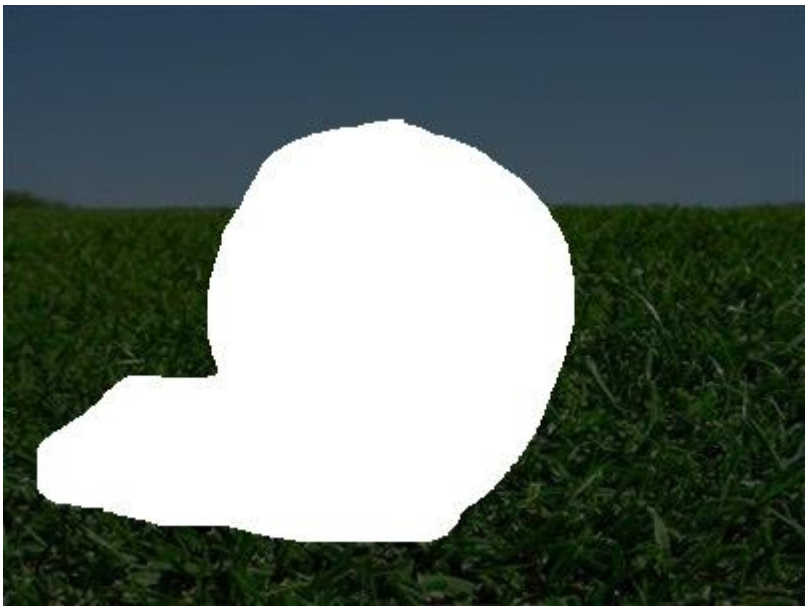

Figure 8 Paint white before step 2

Save image after painting before step 2, then press ‘Step2, Way1’ and read the saved image that was just painted. After this process, mask image will be generated.

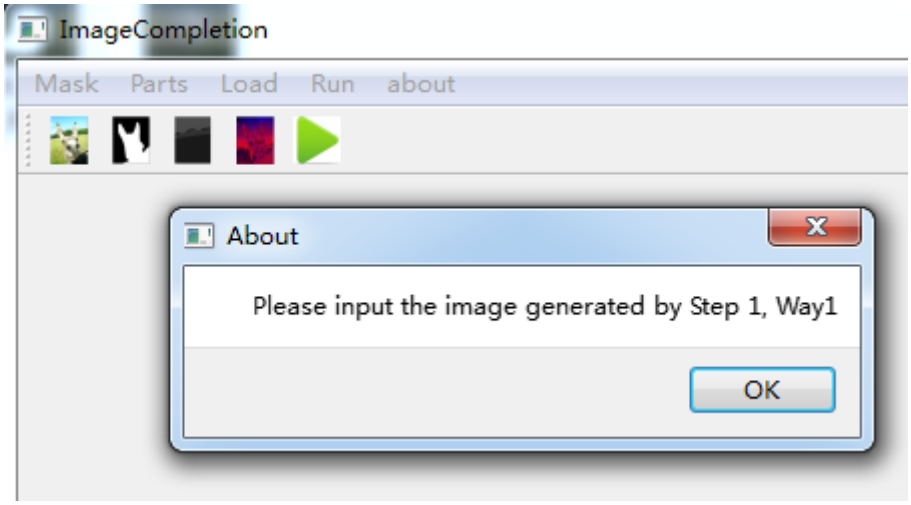

Figure 9 Read image that was painted to get mask

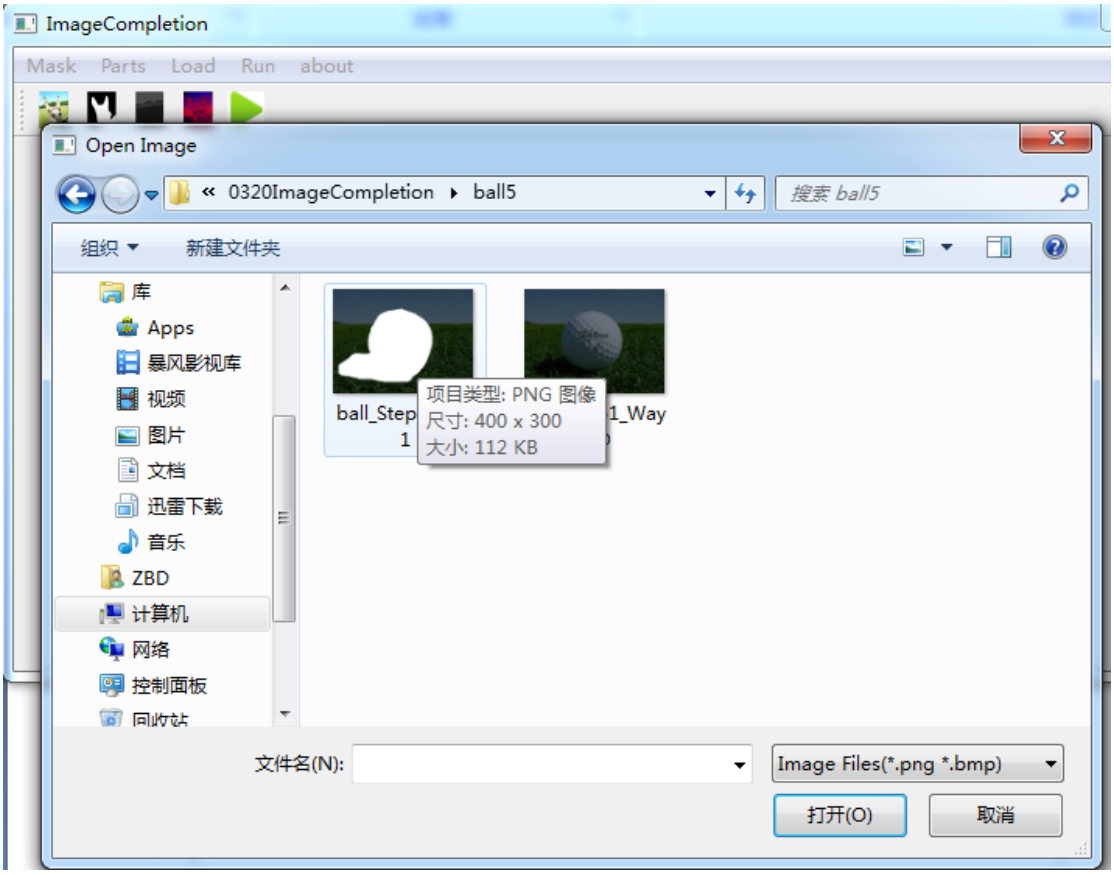

Figure 10 Read image

After successfully reading it, the platform will notify you that mask image has been generated and saved in the same folder.

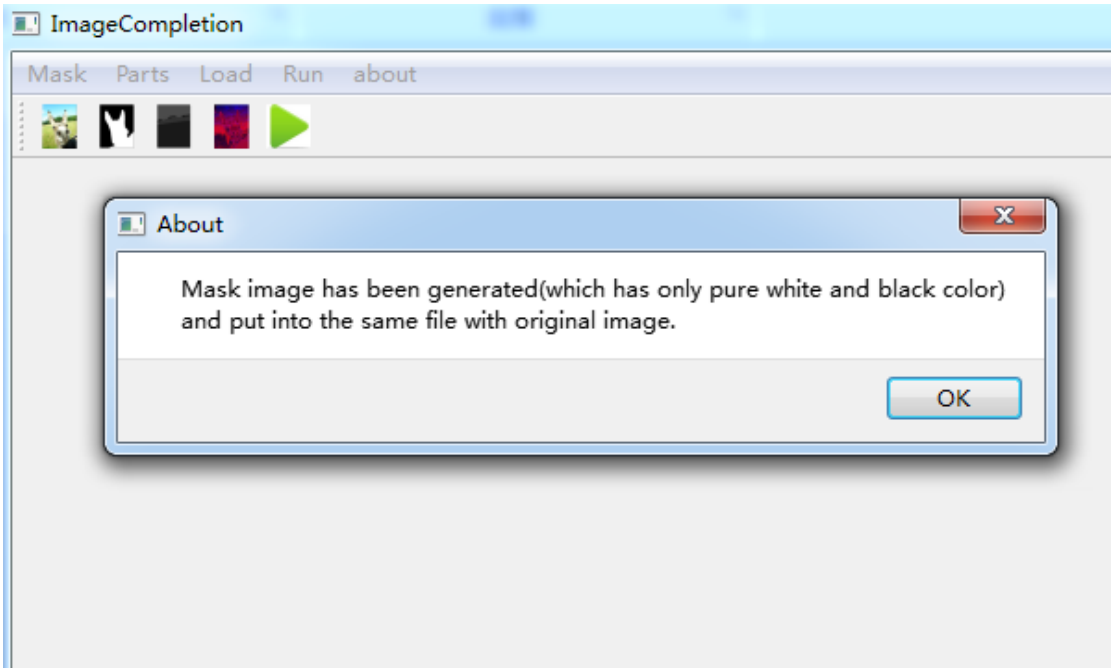

Figure 11 Mask image has been generated

In the folder, you can find a mask image with pure white and black color like below.

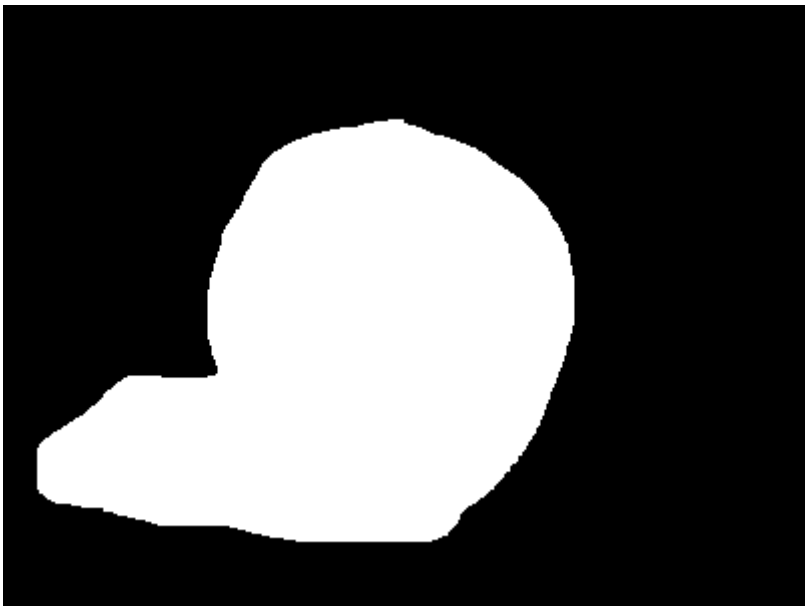

Figure 12 Mask image

Way 2 is another way to get mask image. To use this, just press ‘Step1, Way2’ in ‘Mask’ menu.

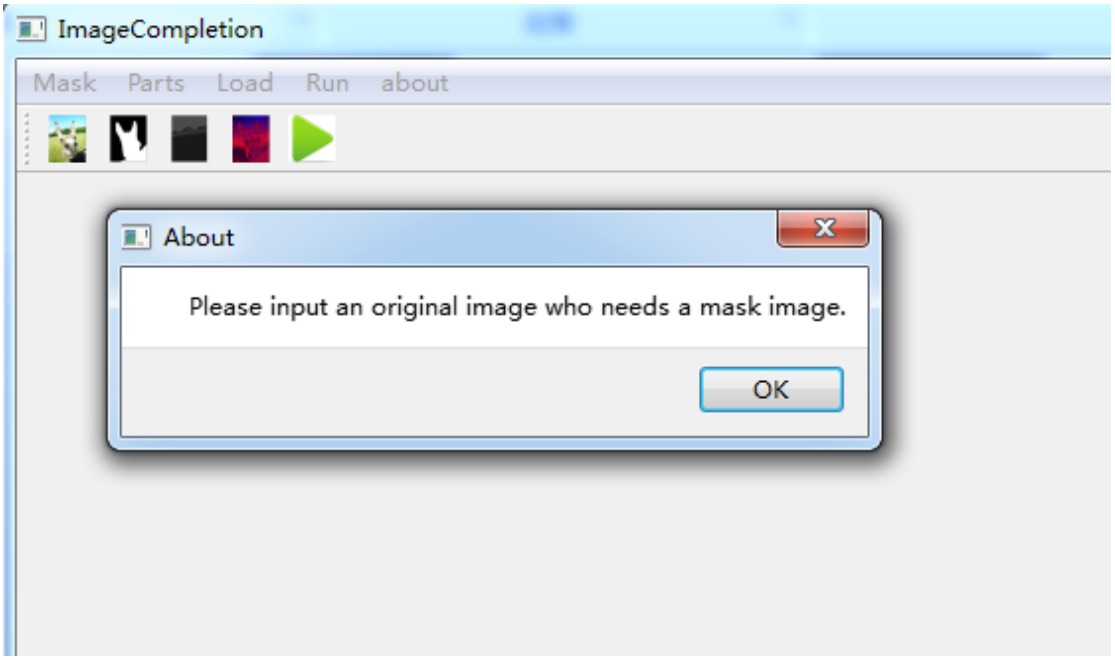

Figure 13 Use Way2 to get mask

Press ‘OK’ and input original image, an image will pop up, users can draw a circle to show mask area, after finish it, press ‘Esc’ button

on keyboard to observe generated mask image. Press ‘Esc’ button again to exit, mask image will also be saved.

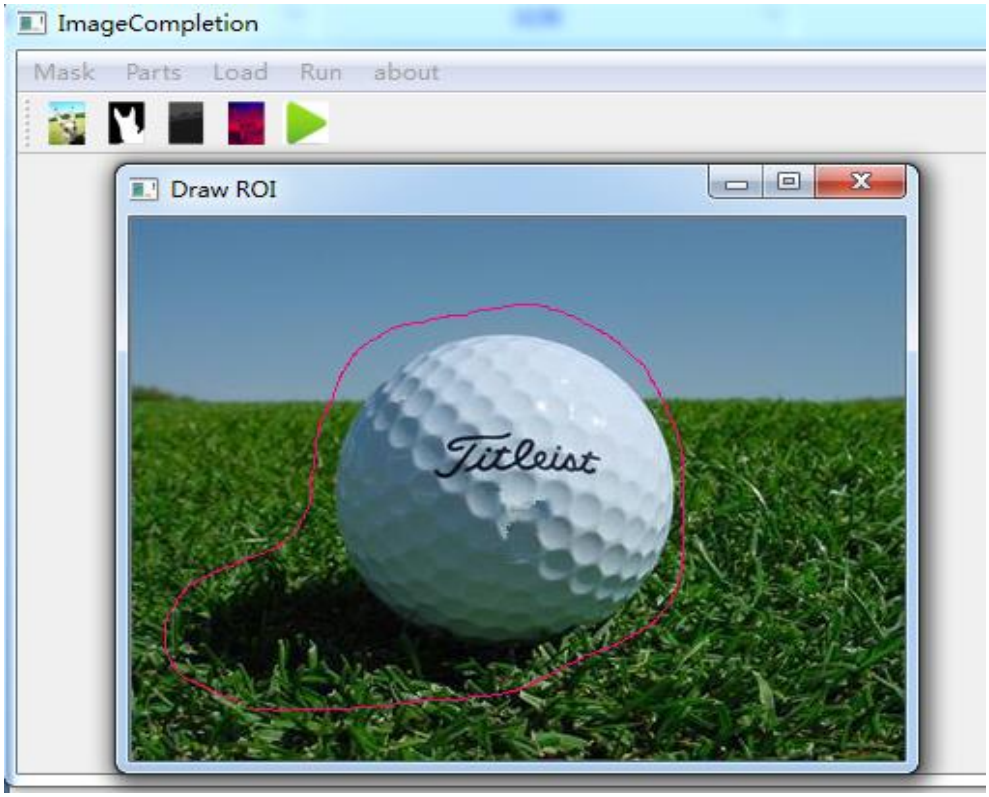

Figure 14 Draw mask area in images

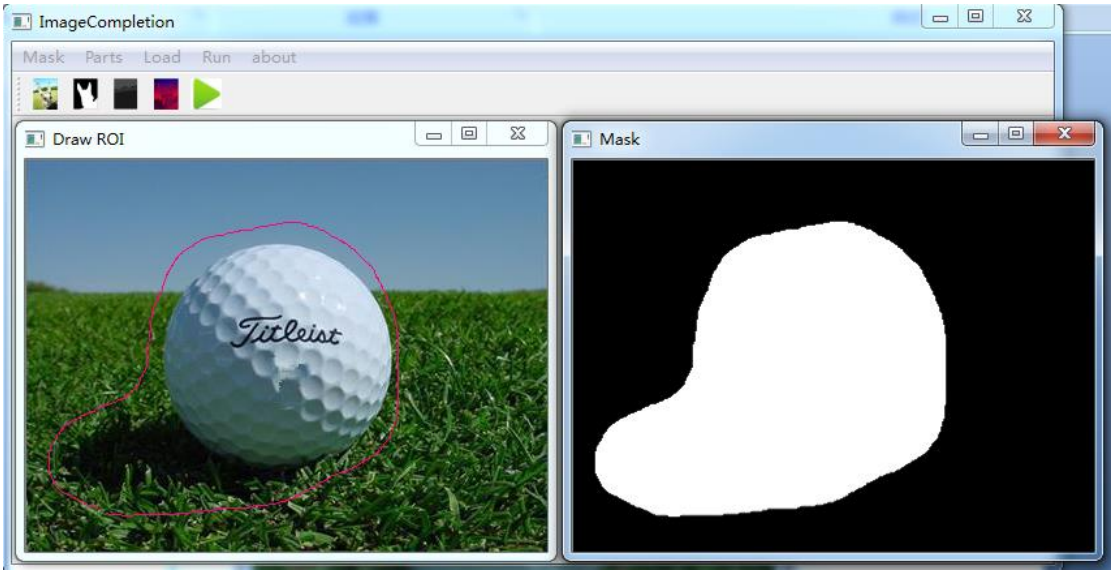

Figure 15 Get mask image

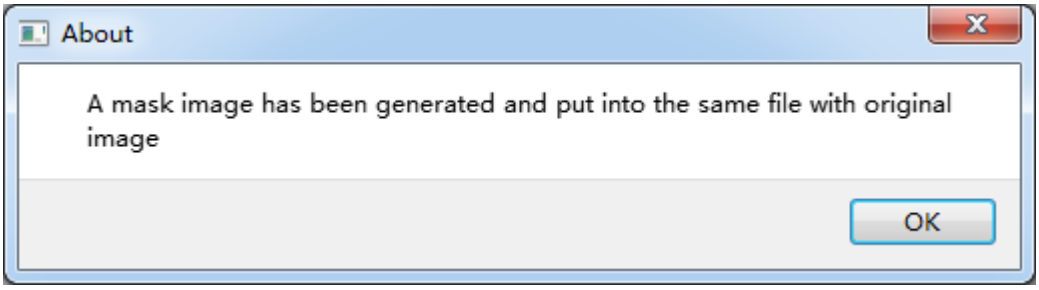

Figure 16 Mask image has been saved

2 Make image that shows different parts

The function of ‘Parts’ menu is to make image that shows different parts of image, which marks the corresponding parts for each pixel.

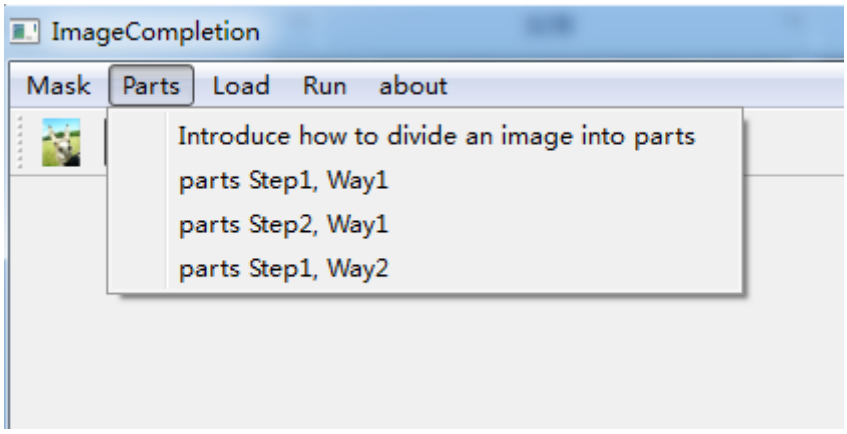

Figure 17 ‘Parts’ menu to help generate different parts

‘Introduce how to divide an image into parts’ introduces function and operations in ‘parts’ menu. Just like making mask, there are two ways to get ‘Parts’ image (Way 1 and Way2). Way 1 requires two steps while Way 2 requires only one step. Way 1 is complex and also needs help from other painting tools, but it can describe mask in details. Way 2 gives user a way to directly draw curves as boundary of mask area but may not be so accurate. Both ways would generate a ‘Parts’ image.

First we introduce Way 1 to get ‘Parts’ image. Press ‘Part Step1, Way1’, and a window pops up as below

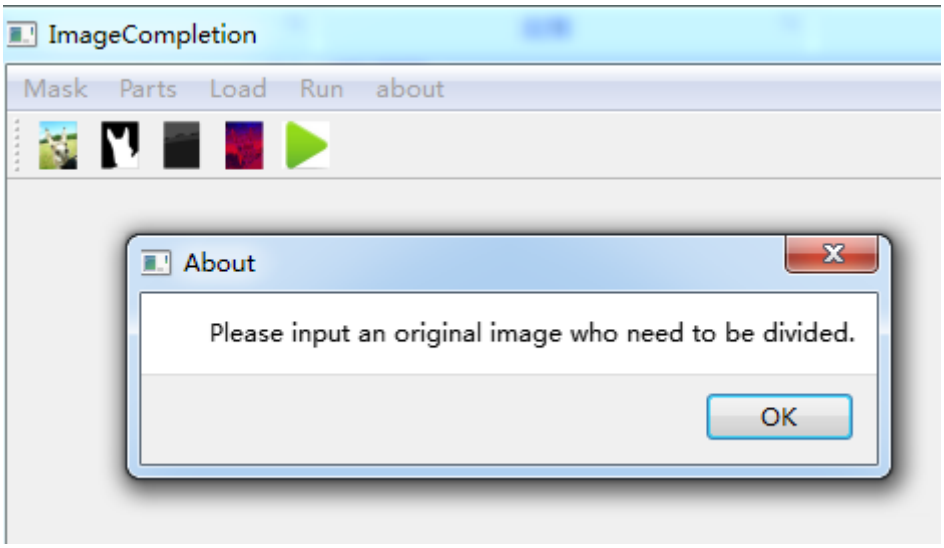

Figure 18 Input original image

Press ‘OK’ and input original image.

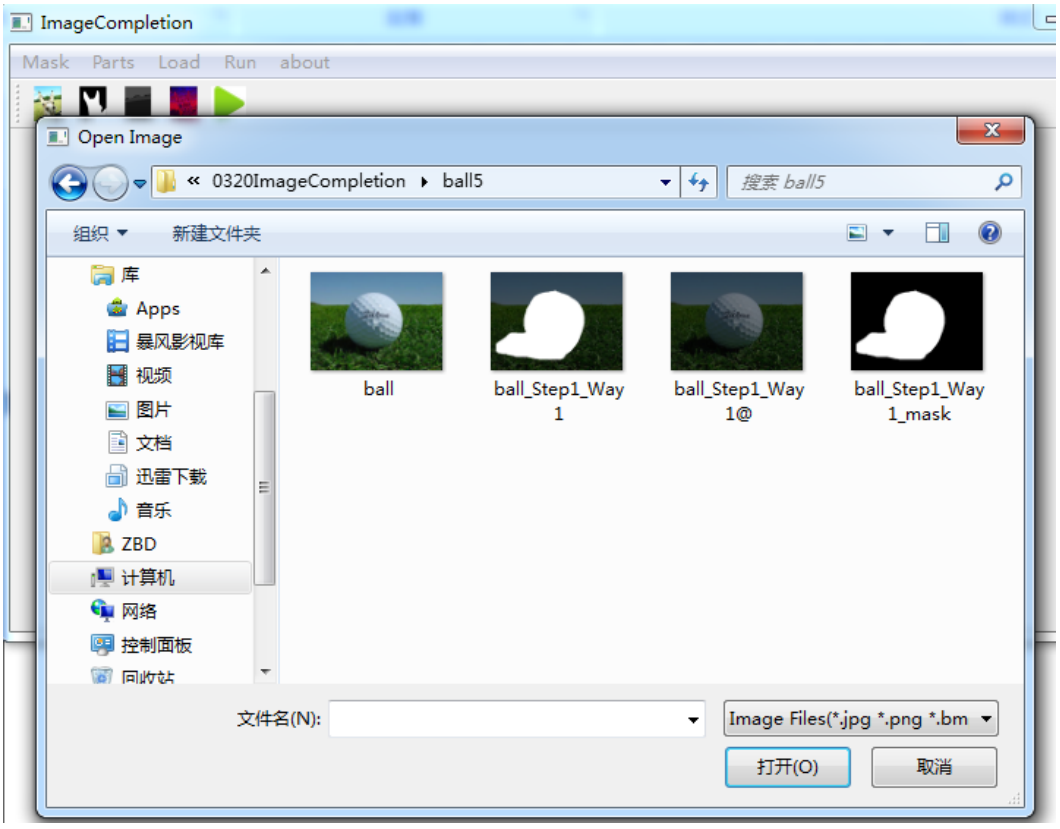

Figure 19 Open Original image

After opening original image, users need to open mask image.

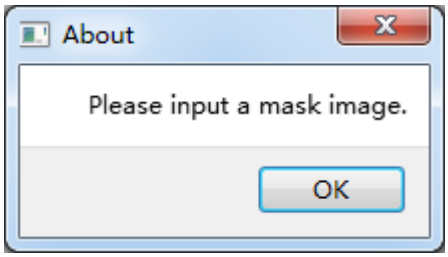

Figure 20 Open mask image

After input mask image, a new image in the same folder will appear as below.

Figure 21 New image after reading original image and mask image

Also there is no pure white color in this image, and red color is used to mark areas to be healed. Users are able to paint white in this image to show different parts. Based on the features of this image, we divide this image into three parts: sky, grass that is far away, grass near us. We use other painting tools to paint the three parts separately and get three images as below.

Figure 22 Paint part 1

Paint 23 Paint part 2

Figure 24 Paint part 3

In these images, we deliberately make part 3 overlaps with part2, just to show that if a pixel is painted white in part i, then even if the same pixel is also painted white in part j(j>i), this pixel will still be put into part i, because smaller number has higher priority. By this algorithm, when we are drawing important lines(line skyline), we just need to carefully draw it once.

After saving these three images (maximum is nine), press ‘parts Step2, Way1’ in ‘Parts’ menu to read the three images in order. Finally in the same folder, ‘Parts’ image will be generated as below.

Figure 25 ‘Parts’ image

Also Way2 is another way to get ‘Parts’ image. Press ‘Step1, Way2’ to input original image and mask image, then users can draw circles for different parts. The first circled area is part1, press ‘Esc’ on keyboard after finish first circle, then draw second circle and so on. Every time program would ask whether users need to draw another circle. Users can exit at any time after finish it.

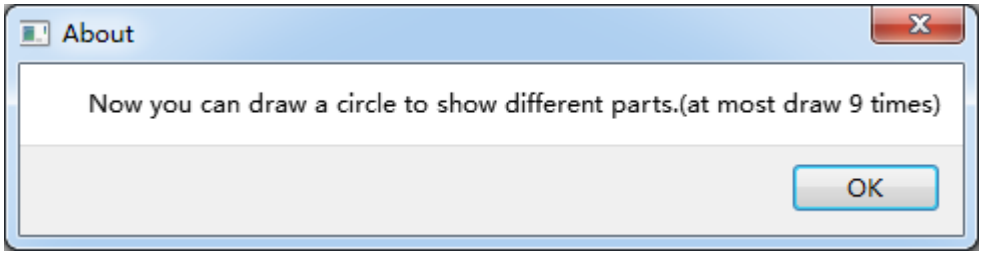

Figure 26 Use Way2 to get ‘Parts’ image

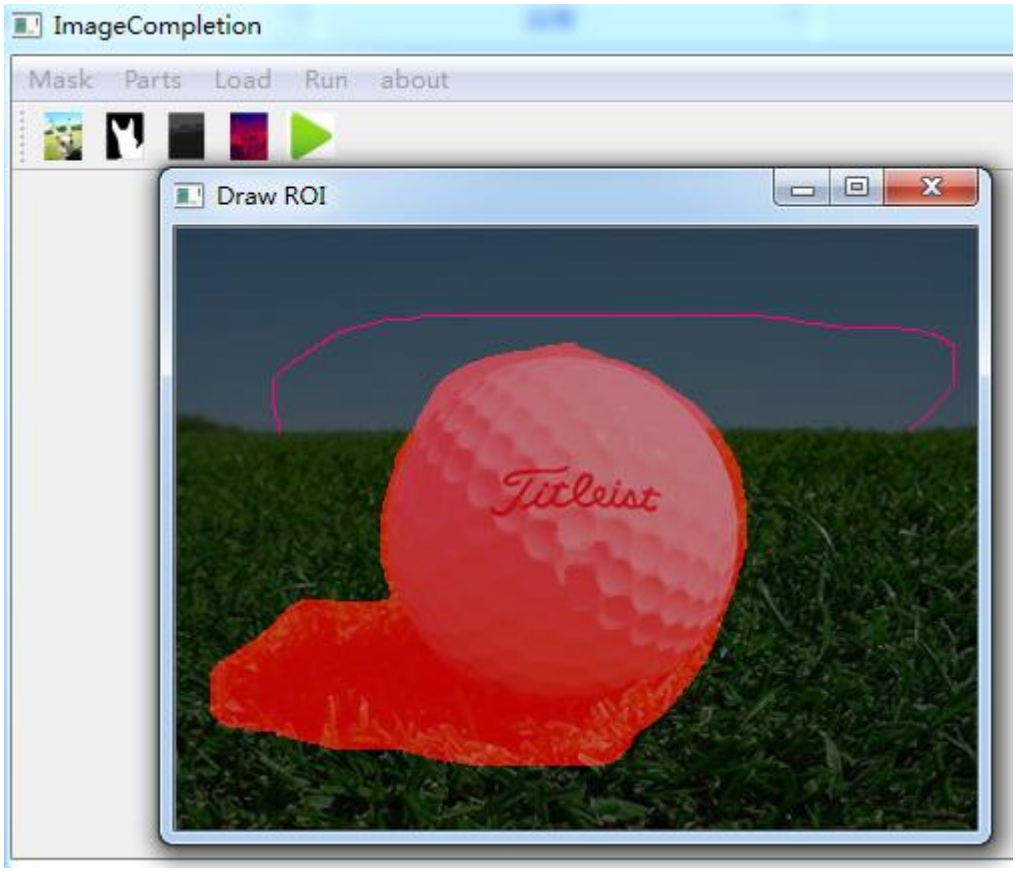

Figure 27 Draw curves to divide areas

After finish area 1, press 'Esc'. (The curve is allowed to be open, the two end points will be automatically linked together)

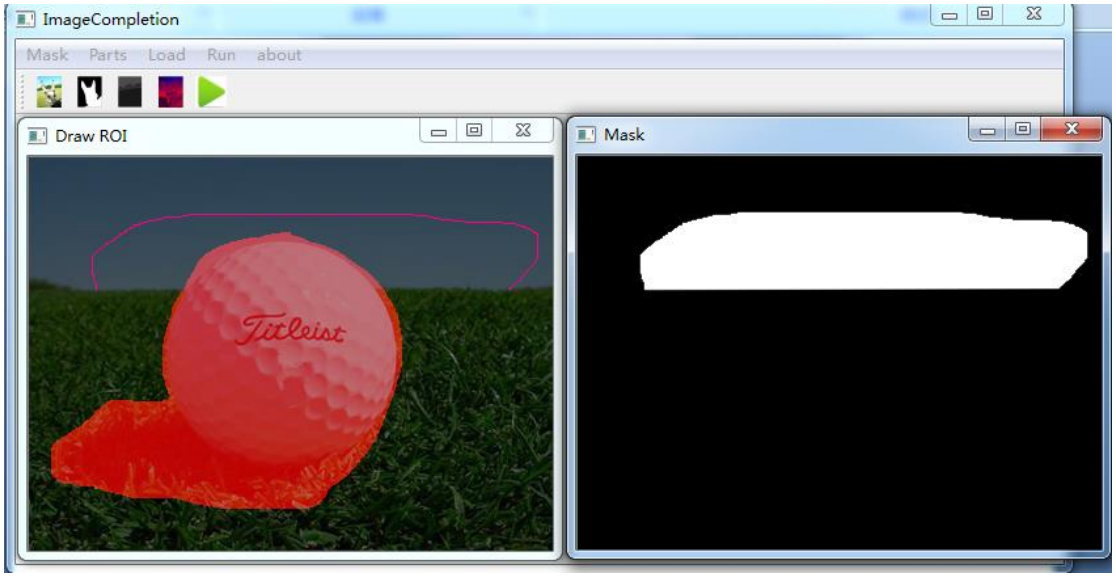

Figure 28 Get part 1

Press 'Esc' again to close the two windows above.

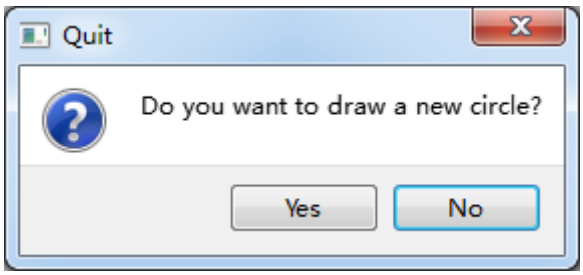

Figure 29

Press ‘Yes’ to draw part 2.

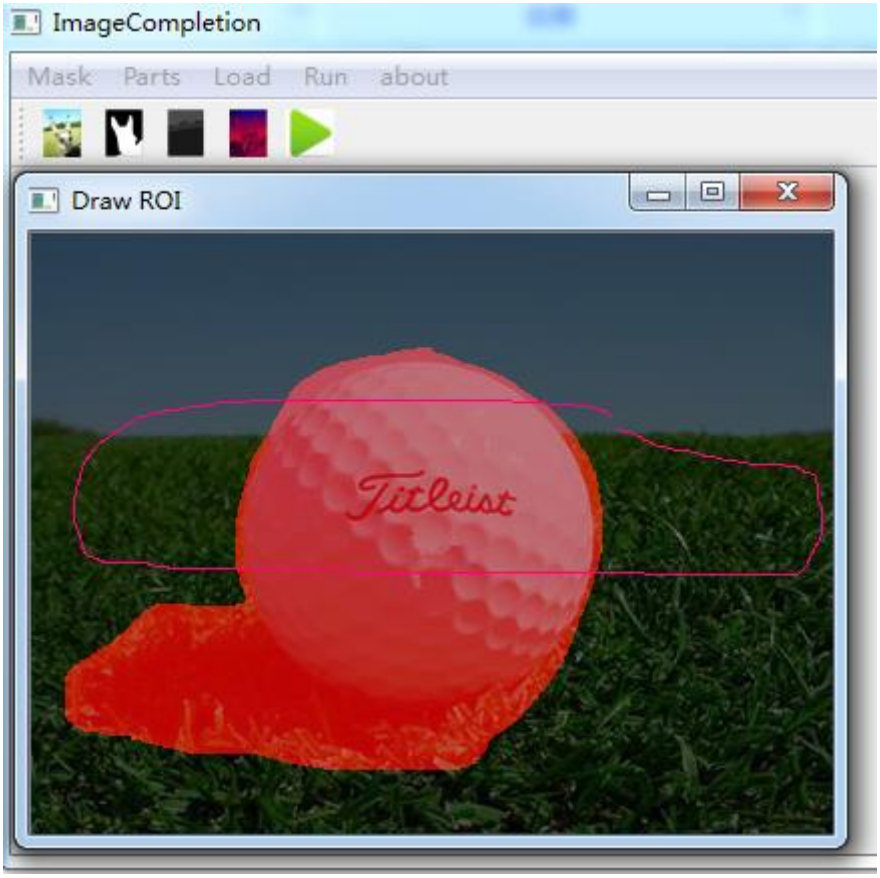

Figure 30 Circle part 2

Press ‘Esc’ to show finished.

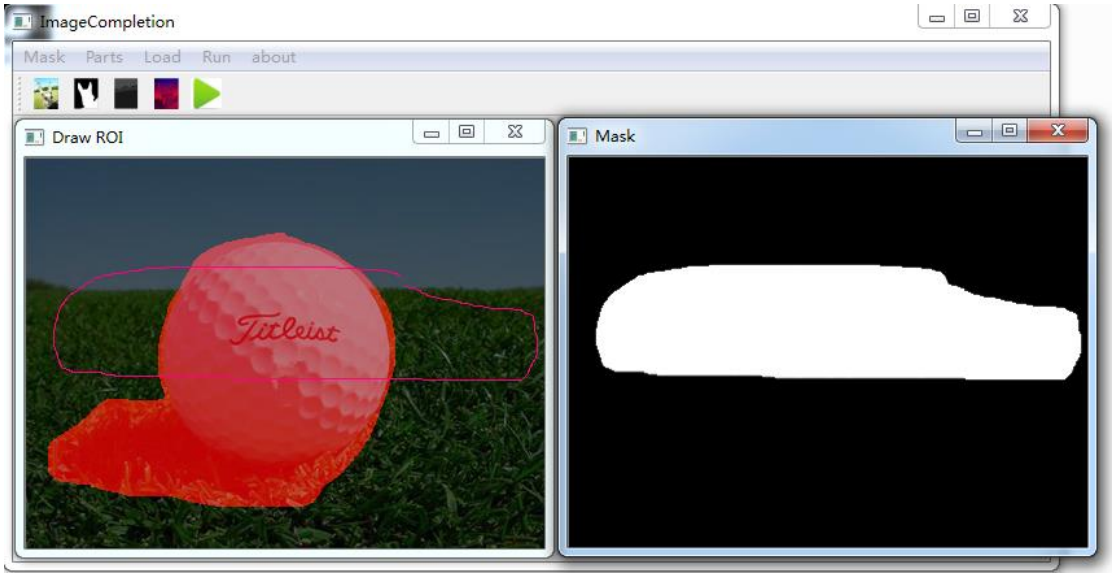

Figure 31 Circle part 2

Press ‘Esc’ again to close the two windows above.

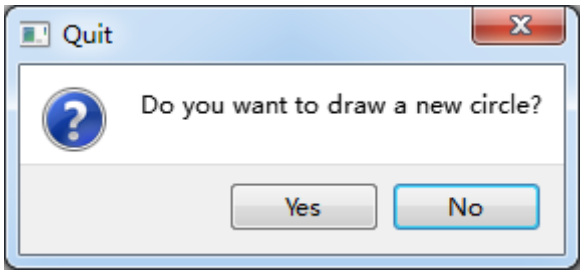

Figure 32

Press ‘Yes’ to draw part 3.

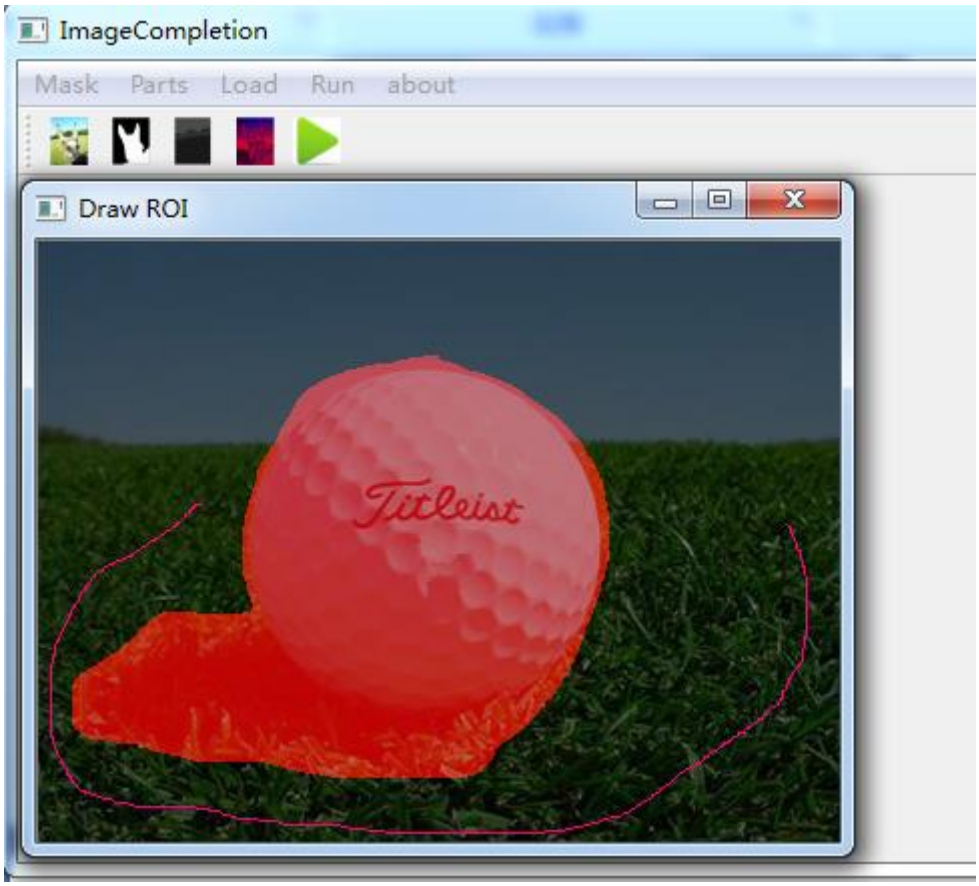

Figure 33 Draw part 3

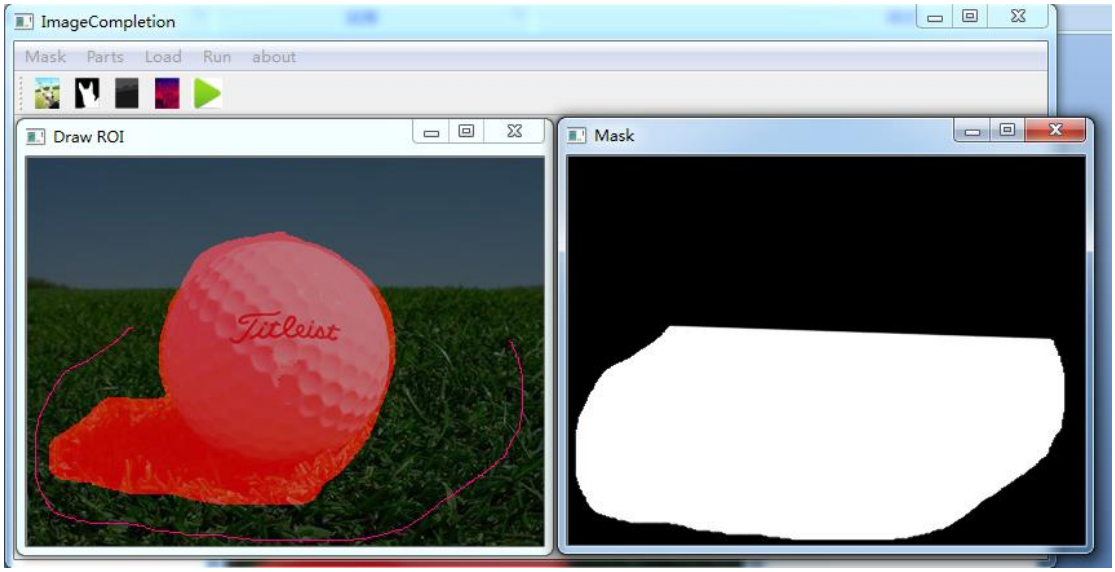

Figure 34 Get part 3

After finish drawing, the ‘Parts’ image will pop up and be saved.

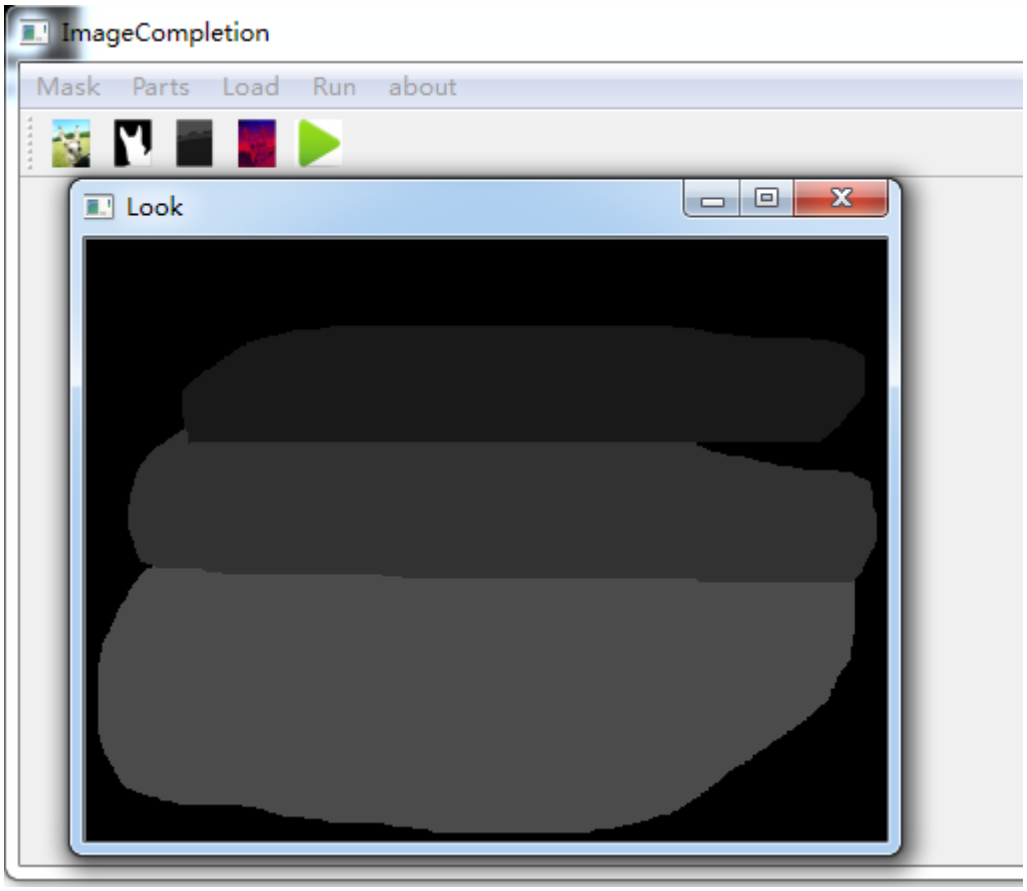

Figure 35 ‘Parts’ image

3 Load Images

After running first two menus, original image, mask image and ‘Parts’ image can be used to run image completion program. Before running, load all the three images in ‘Load’ menu.

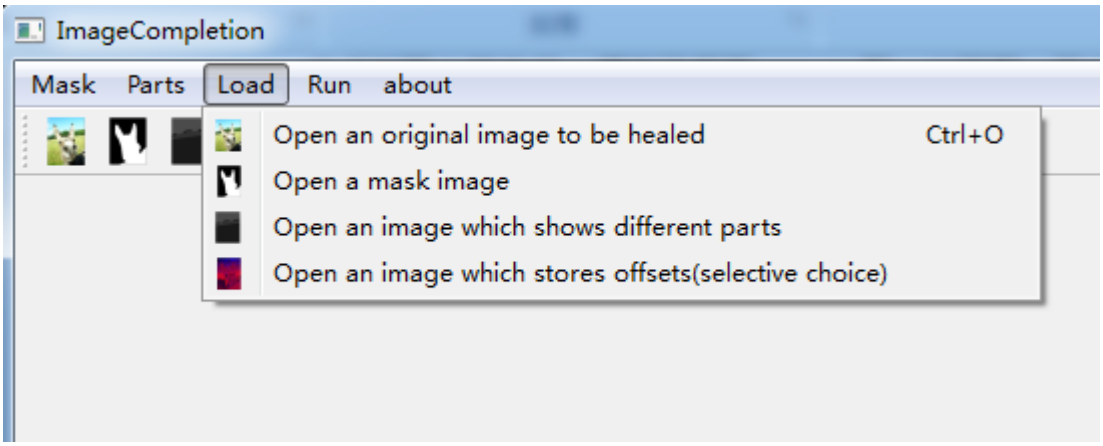

Figure 36 Load images

The fourth option in 'Load' menu allows us to read image that shows the statistic features of original image. In first running, there is no such image, so we don't need to read this. However, if users is not satisfied with result and want to run again, the statistic image would be generated in folder in first running, so users just need to input that image in second running to save running time.

There are several icons below menu bar, the functions are same as functions in 'Load' menu.

4 Running

After loading images, press 'Run' button to activate image completion program, also user can do it by pressing the green triangle in tool bar.

The first step is to provide patch offsets that helps to guide the image completion by user interaction, (You can also press 'Esc' for not providing it)

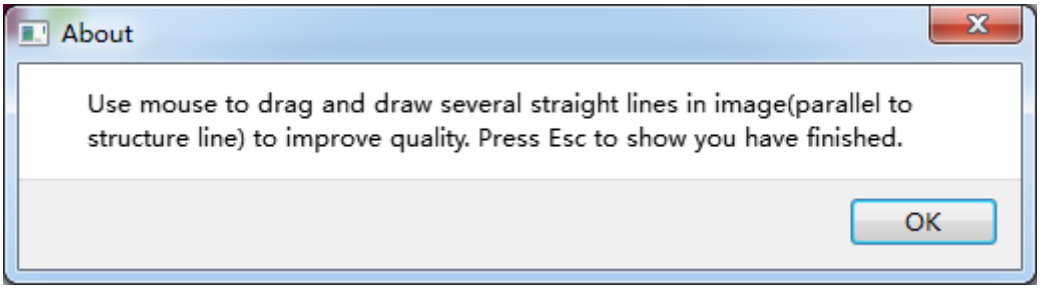

Figure 37 User interaction to provide patch offsets

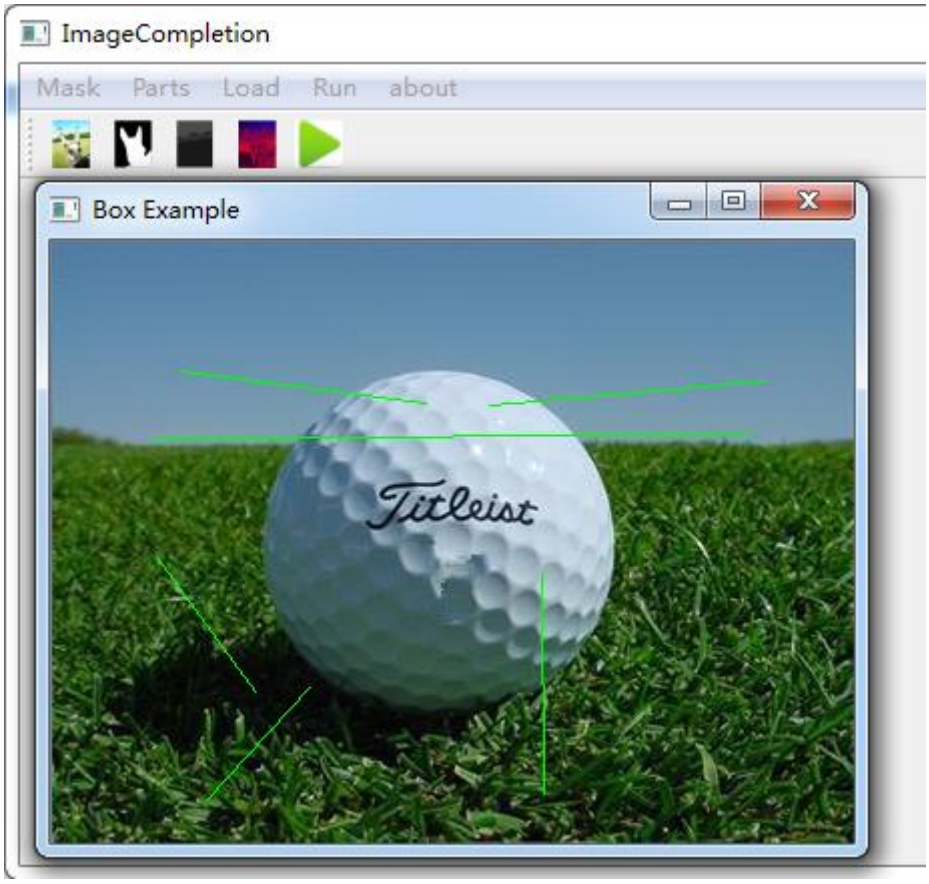

Figure 38 Draw straight lines to generate patch offsets

Then the program will calculate statistic feature of image, a progress bar will show the progress.

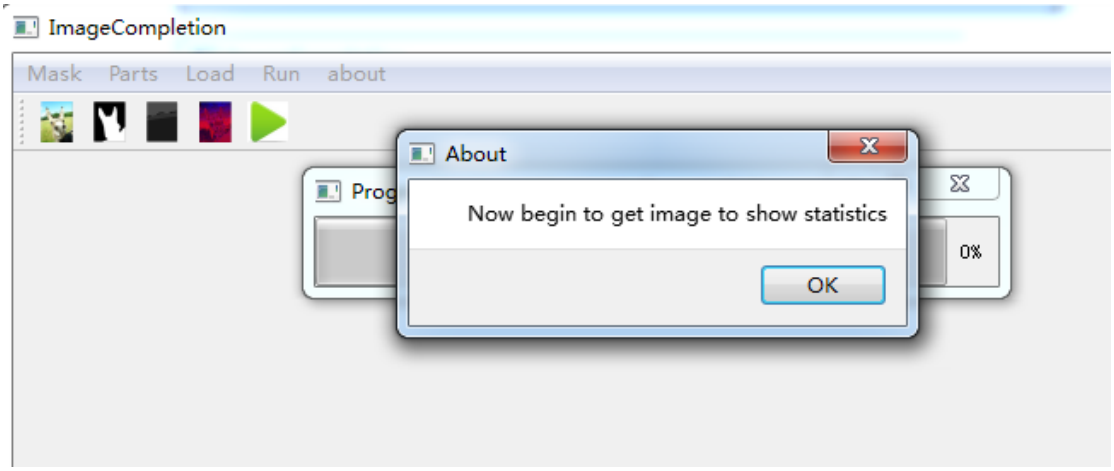

Figure 39 Start to calculate statistics of image

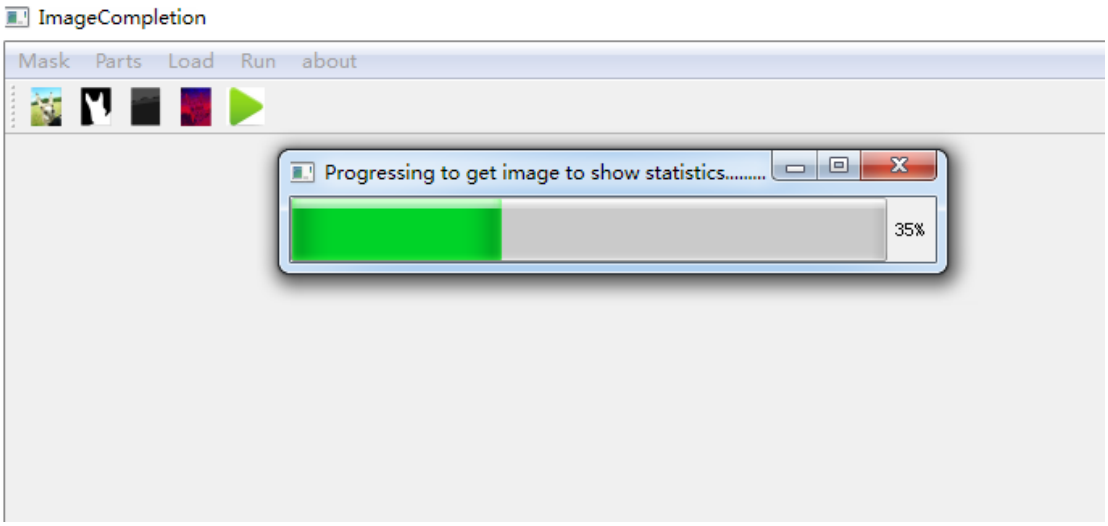

Figure 40 Calculating statistics of image

After finishing calculation, a new image will be generated, next time if users want to run the same image, users can just read this image and avoid calculating statistics again.

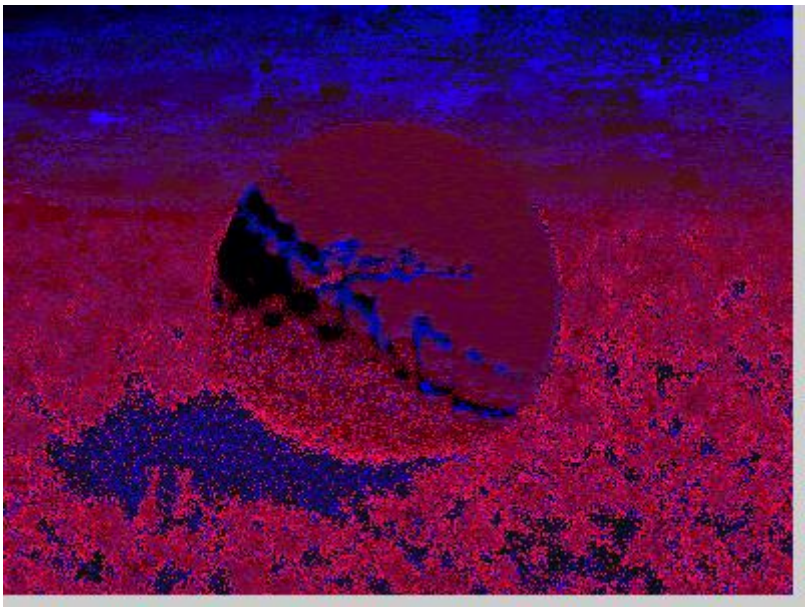

Figure 41 Statistics image

The program will ask users whether they want to observe the whole process of image completion (Figure 42). choosing 'Yes' will show the image completion process step by step, which has a low speed, choosing 'No' will pop up a progress bar to show the progress.

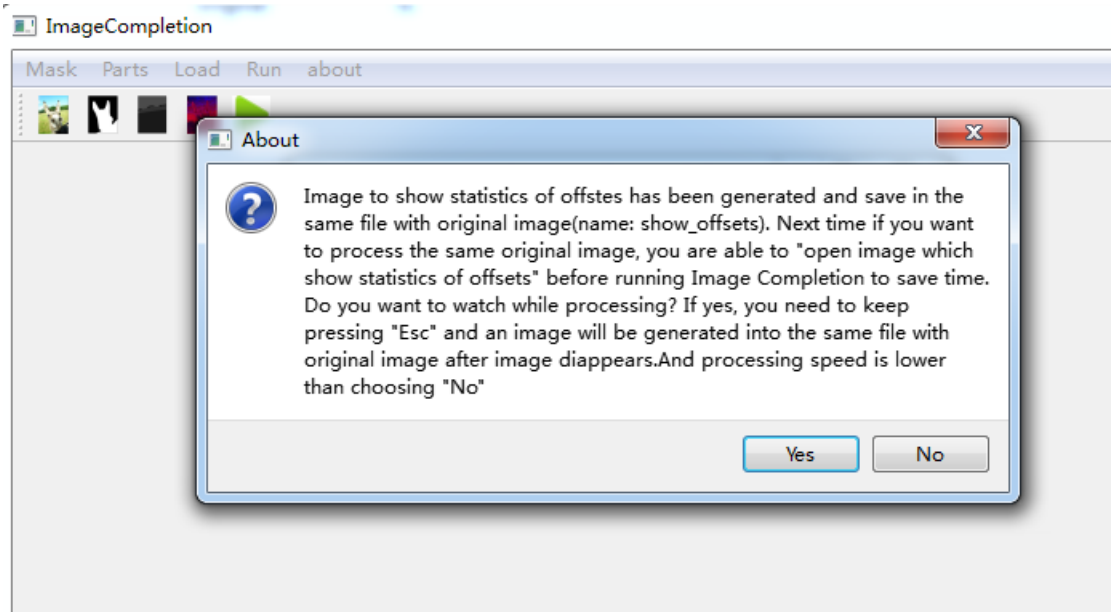

Figure 42

Choosing ‘Yes’ to get window below.

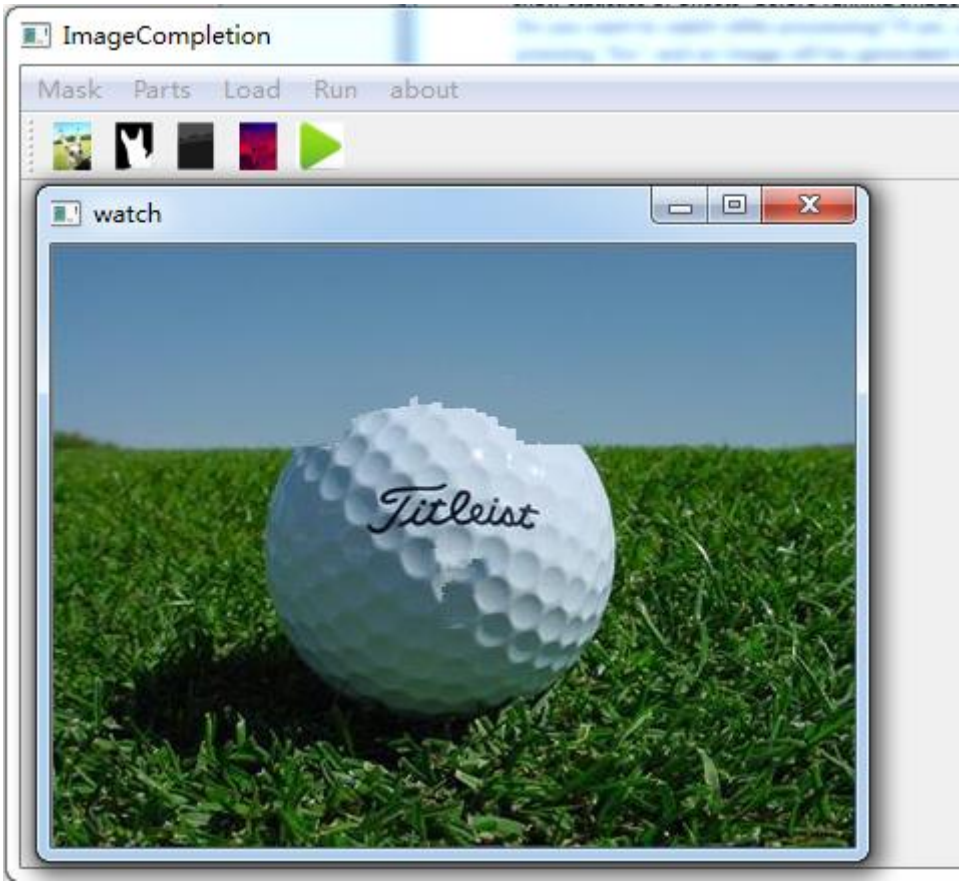

Figure 43 Gradually heal part 1

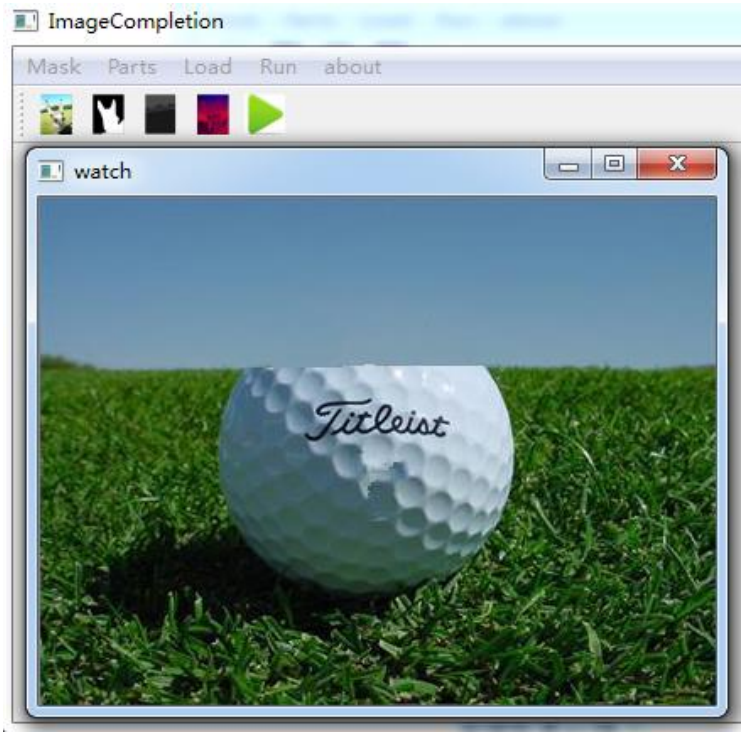

Figure 44 Finish part 1, start to heal part 2

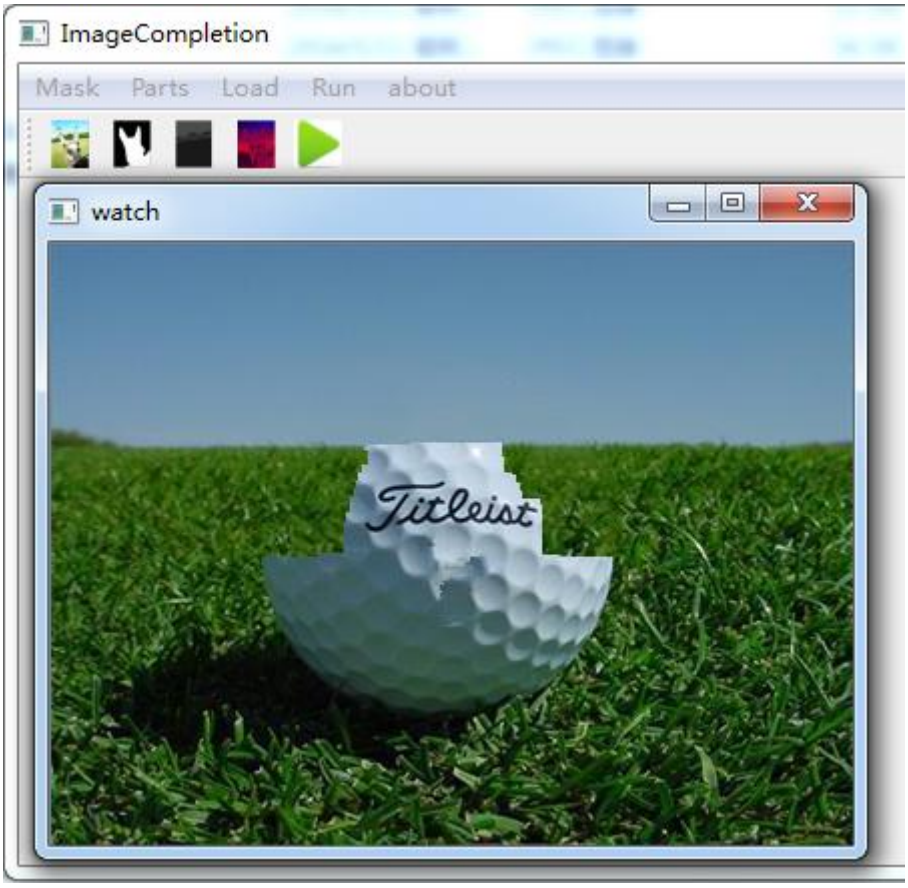

Figure 45 Healing part 2

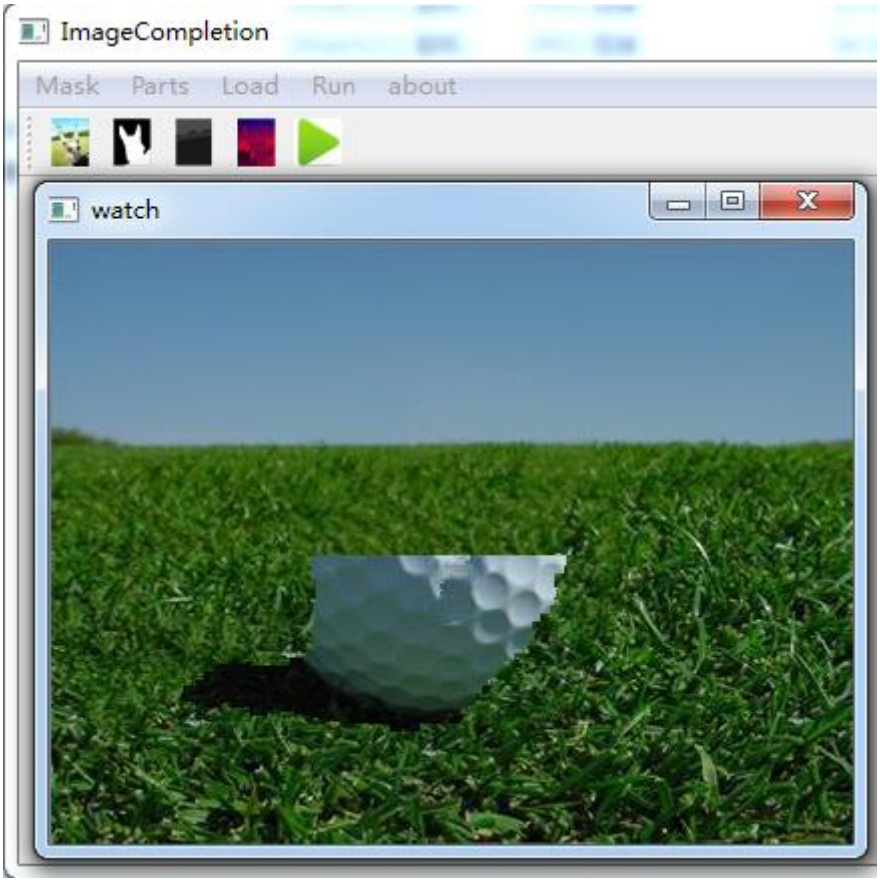

Figure 46 Healing part 3

After finishing it, the window will automatically close and shows that image completion is complete.

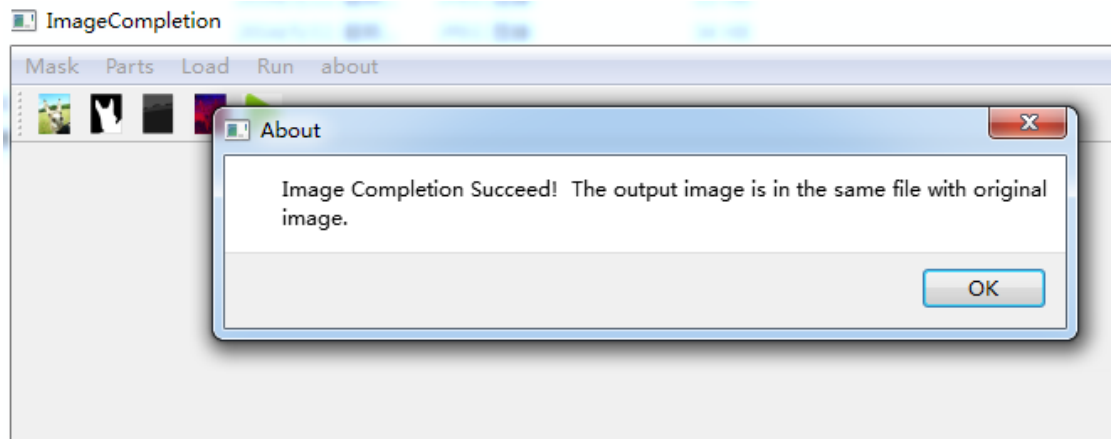

Figure 47

Choosing 'No' to get progress bar below.

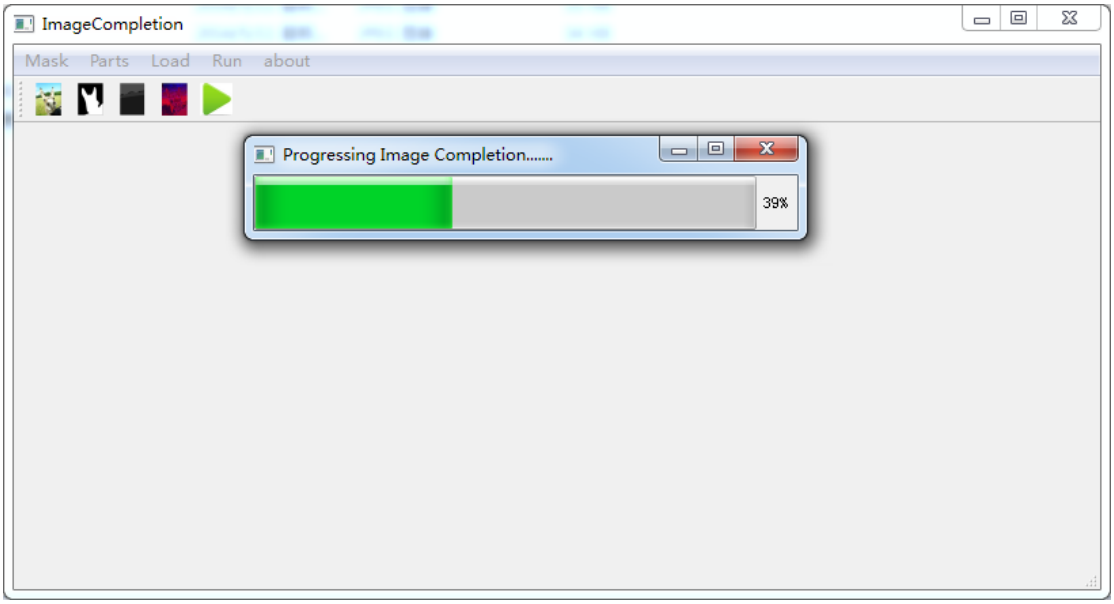

Figure 48 Image completion without observing

Users will get notification after completion

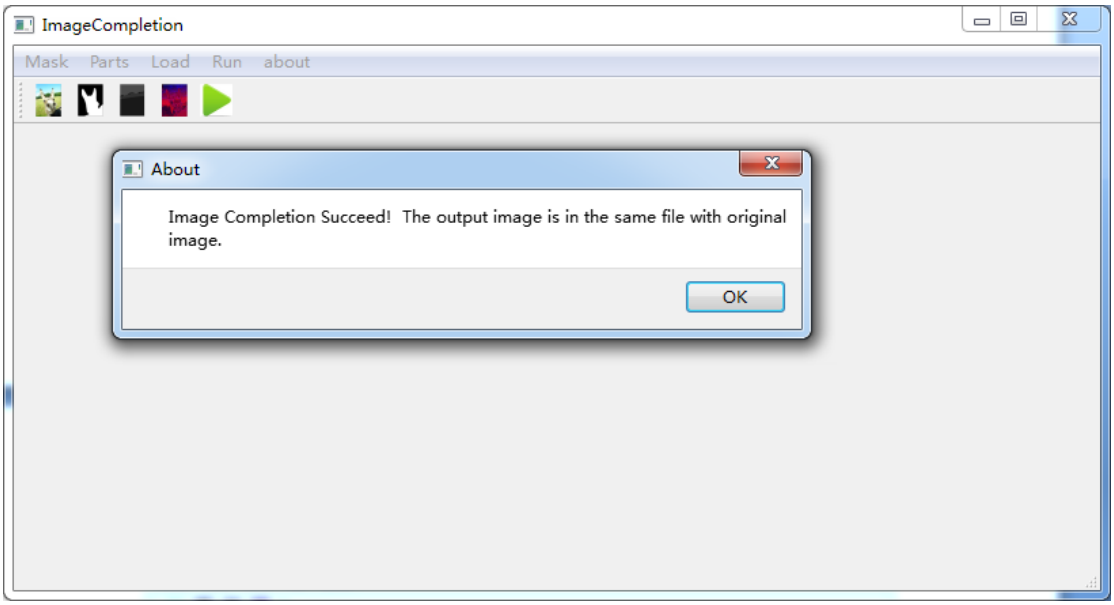

Figure 49 Image completion succeed

The final result will be saved in the same folder

Figure 50 Final result