Computational Depth-of-Field

Jiacong Li 5656354

1. Introduction

In this final project, the user can select an image and blur all other unfocused parts of the image based on the selected focus point. This can be seen as a simulation of the depth of field of the picture taken by the camera.

Users can scribble on the image to select different depths of field, and can choose which parts of the depth of field to ignore. And users can select the focus of the picture to reduce blur, and simulate the camera's aperture to select the degree of blur in other parts except the focus.

Finally, a picture with depth of field processed according to the focus and aperture set by the user will be output.

Anisotropic diffusion and cross bilateral filter are used to get the depth map of image and blur the image.

2. Results

Figure 1 shows the UI of the application with user's scribble. From the UI it can be seen that the focus poin is chosen as (174, 250), which is on the build with black roof top on the left bottom of the image. The aperture is F17 which is very small and means less depth of field (less blurred);
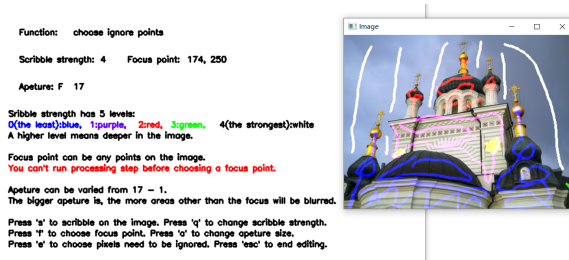

Figure 1: *UI*

In the process of image processing, there will be a total of 5 indirect results and a final result. As shown in the 5 figures below.

Figure 2 shows the user's scribbles on the image, indicating the depth of field intensity of the image specified by the user.

Figure 2: *User's scribbles*

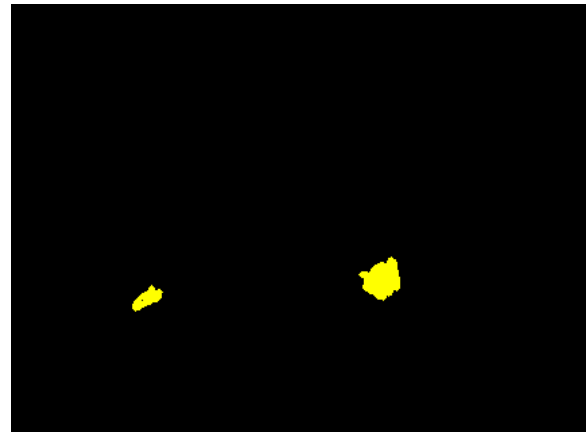Figure 3 shows the user-selected areas to ignore for depth-of-field calculations.

Figure 3: *User's scribbles*

Figure 4 shows the mask created for depth map calculation.

Figure 4: *Ignore area*

Figure 6: *Depth map*

Figure 5 shows a brightness image of input as a guide image for anisotropic diffusion to add edge details.

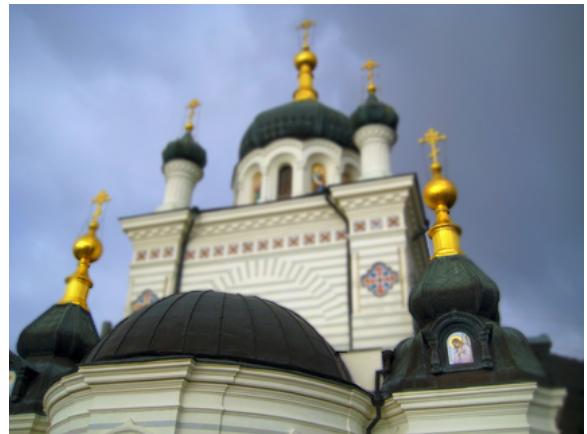**Figure 5:** *Brightness of image*

Figure 7: *Final result*

Figure 6 shows the depth map calculated according to user's scribble and image edges.

Figure 7 shows the final result, a blurred image according to depth map and focus point and aperture set by the user.

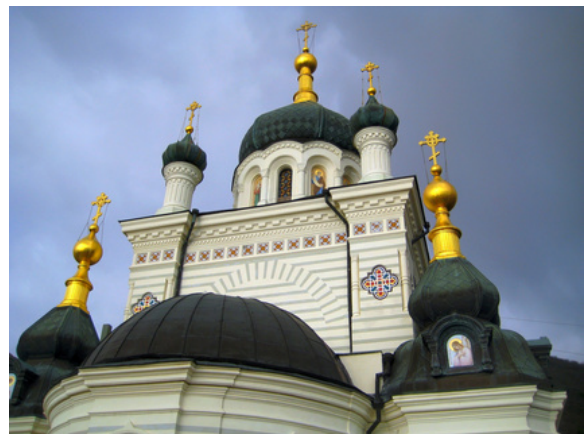Compare to the input, it can be clearly seen the building on the back is blurred.

Figure 8: *Input*