Magic Wand Tool for Region Selection

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Abstract—**Magic wand is a tool used in digital image editing applications that allows selection of connected group of pixels by indicating a few reference pixels inside the region to be selected. This paper discusses the MATLAB implementation of magic wand tool that allows users to select points in the interactively chosen image and outputs the selected region of the image.**

Keywords—tolerance; gray scale; RGB image; MATLAB, Photoshop

I. INTRODUCTION

Magic wand tool is used in Photoshop to select a region in digital image whose colors are within predefined tolerance of some reference pixels. The strength of the tool lies in its ability to select large areas of pixels sharing similar tone or color by selecting just a few points in the image. The tool also makes separation of foreground from background easier. In this paper, the magic wand tool of Photoshop is illustrated and compared with the tool implemented using MATLAB. The paper also discusses the algorithm used in MATLAB implementation of the tool and presents the results of the simulation.

II. MAGIC WAND TOOL IN PHOTOSHOP

The illustration below shows the application of Photoshop's magic wand tool[3] to select sky in the input image (Fig. 1).

Fig. 1. *Input image*

In the illustration tolerance is set to default value of 32. The tolerance option tells Photoshop how different in tone and color a pixel can be from the area clicked on for it to be included in selection. By default the tolerance value is set to 32 which means that Photoshop will select any pixels that are the same color as the area clicked on plus any pixels that are 32 shades darker or 32 shades brighter. If only one point is clicked in the top left of the image (Fig. 2), entire sky is not selected (Fig. 3). This is because the tolerance value of 32 is not quite high enough to cover the entire range of tonal values present in the image of sky, hence leaving a large area of the sky directly above the buildings out of selection.

Fig. 2. *Encircled point shows the chosen pixel for selection of sky*

Fig. 3. *Output image*

To chose the entire sky one more selection can be added to the initial selection by selecting a point in the non selected region (Fig. 4). The result is shown in Fig. 5.

Fig. 4. *Selecting 1 more point in the non selected region*

Fig. 5. *Final output image*

III. MATLAB IMPLEMENTATION OF MAGIC WAND TOOL

The MATLAB program developed to simulate the Photoshop's magic wand tool allows the user to interactively select an RGB or gray scale image from the system and feed in the value of tolerance. The default value of tolerance is set to 40. The user can then click on the image using mouse cursor to

choose the points for the selection of the desired region. The output is the masked image showing only the selected region.

The image used for simulation is the same image used in the illustration of Photoshop's magic wand tool. The objective is to select the sky in the input image (Fig. 6). The image in the Fig. 6 also shows the points (marked in blue) chosen for the selection. Tolerance is set to default value of 40.
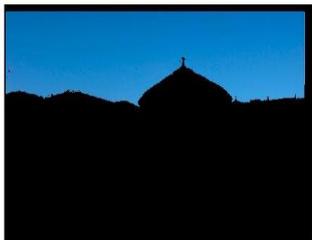

Fig. 6. *Input image*

Fig. 7. *Output image (Tolerance = 40)*

In the output image (Fig. 7) entire sky can be seen as being selected. When the value of tolerance is set as 30, entire sky is not selected because the tone of the pixels in the non selected sky does not fall within the tolerance value of 30 (Fig. 8).

Fig. 8. *Output image (Tolerance = 30)*

The next objective is to select the foreground (the buildings) in the same input image. This is done by selecting the sky first and then inverting the selection because it is easier to select the background (the sky) as compared to selecting the foreground (the buildings). The simulation is done for tolerance equal to 40 (Fig. 9) and tolerance equal to 30 (Fig. 10).

For tolerance value of 30 (Fig. 10), apart from the buildings, a small part of the sky is also selected because that part of the sky was masked while selecting the background (Fig. 8).

Fig. 9. *Output image (Tolerance = 40)*

Fig. 10. *Output image (Tolerance = 30)*

IV. ALGORITHM

Once the user selects the image interactively and marks the points on it using mouse cursor, the (x,y) coordinates of the pixels (corresponding to the marked points) are stored and these pixels are called reference pixels. For gray scale images the difference between intensity of every other pixel in the image and the intensities of the reference pixels is compared with the tolerance value. For RGB image, the difference between intensity of each channel (red, green and blue) of every other pixel in the image and the intensity of the corresponding channel of the reference pixels is compared with the tolerance value.

The intensities of those pixels of the input image for which the difference is less than or equal to the tolerance value are set to 1 and the intensities of the remaining pixels are set to 0. This develops a binary mask of the original image.

The connected components in the binary mask are labeled. 1 is assigned to pixels having connected components and 0 is assigned to pixels having no connected components. The intensities of the pixels whose coordinates are near to the coordinates of the reference pixels are set to 1 and the intensities of the remaining pixels are set to 0. This is to ensure that the selected pixels are side by side each other in the same area that is clicked on. The new binary mask thus developed is multiplied with the input image to give the desired output image.

If foreground of the image is to be selected then the complement of the new binary mask developed by selecting the background is multiplied with the input image.

V. CONCLUSION

The MATLAB implementation of the magic wand tool works well for a few particular values of the tolerance depending on the nature of the tone and color variation in the region to be selected. It simulates Photoshop's magic wand tool in separation of foreground from background.

REFERENCES

For the MATLAB implementation of the magic wand tool, the MATLAB code downloaded from the link in [2] is modified to simulate Photoshop's magic wand tool.

[1] Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing," third edition, 2009

[2] http://www.mathworks.in/matlabcentral/fileexchange/6034

[3] http://www.photoshopessentials.com/basics/selections/magic-wand-tool