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Scene Interpolation Based on Differential Pixel Color Comparison

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Abstract : ***The aim of computer graphics is headed toward the 3D realistic graphics. After applying physics, mathematics and real life observations to their projects every field is require 3D representation. For 3D view reconstruction from multiple images require stitching of images. At the time of stitching may be possible to miss some part of view filed. Thus we need to interpolate these small patches with the help of image processing.***

As we know that the interpolation is the process of defining a function that takes on specified values at specified points. If we require interpolating missing area in a photo, we need a function that can return the value by which the pixel in missing area can be filled. We are proposing a fusion scheme that will fill the missing area with the surrounding pattern. Since in this scheme require color of next pixel is depend upon the difference values of previous colored pixels, hence the scheme is called Differential Pixel Color Comparison.

Keywords
Image Interpolation, Scene Interpolation, Missing Area Filling, Image Transformation.

Introduction
It is our view the computer entertainment industry is becoming crazy to use 3D graphics in their projects. Today is the day of technology and there are lots of range cameras available in the market, but they have limit to capture a photograph. In the entertainment industry requirement of a wide view can we done by the multiple image and image processing for 3D view because camera gives the 2D view of limited area. When we require visualizing the panoramic view of any huge area, it is compulsory to mosaic these multiple images for a single view. In this case there is a possibility to missing some regions in the image. So the image interpolation is needed. Interpolation is the way through which a panoramic view is completed and creates a clear and final picture in-front of viewers. There are many different types of interpolation methods are explained, but they require much time and some of them are not very effective. Interpolation is the important operation for image quality. Our method is a diagonal interpolation that depends upon Lower Right Corner and Upper Left Corner of the patch. Diagonal interpolation methods can only go far, and found that non-diagonal methods are superior. Some non-diagonal interpolation methods include Bi-Cubic, Soft Directional permutation filters. Most high ended image manipulation and viewing programs today have some sort of interpolation process and used when resizing an image.

Algorithmic Steps
1: Enter the X and Y co-ordinates of Lower Right corner of the patch and X and Y co-ordinates of Upper Left corner.
2: Choose seed pixel Lower Right Corner as P(i, j).
3: Calculate DX=P(i+1, j+1) - P(i-1, j+1) and DY=P(i+1, j+1) - P(i+1,j-1).
4: if DX<0 then seed pixel is similar to P(i, j+1).
5: if DY<0 then seed pixel is similar to P(i+1, j).
6: if DX>=0 then seed pixel is similar to P(i-1, j+1).
7: if DY>=0 then seed pixel is similar to P(i+1, j-1).
8: Copy the pixel color for seed pixel color and decrease counter i, j accordingly.
9: Repeat step 2 to 8 up to Upper Left Corner.

Method and Experimental Setup
In our experiment we are taking a stitched image using two images having one missing area.

Image 1 Lab from Upper Site

Image 1 Lab from Lower Site

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Image 3 Stitched Image of Lab

Image 2 Patched Image of Lab

In our work we start the interpolation process from right to left diagonal filling. The difference between nearest pixel's color values can return the perfect view for missing area. Thus we consider the process pixel as a seed pixel and previously filled pixels are nearest neighborhoods. There are five pixels are neighborhoods. On the basis of color of these pixels the seed pixel will fill. As we shown in the image-5 there is a seed pixel in color black and nearest neighborhoods in blue.

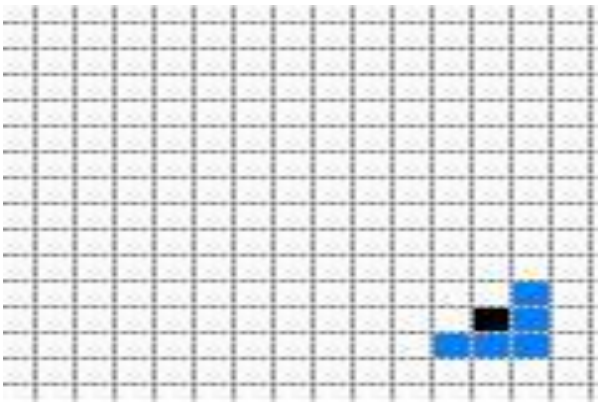

Image 3 Seed Pixel and Their neighborhoods

Suppose i represent X direction and j represent Y direction. So the seed pixel address is P(i, j) now neighborhoods and differences in x and y directions are as follows:

$$DX=P(i+1, j+1) - P(i-1, j+1) \quad \text{and}$$
$$DY=P(i+1, j+1) - P(i+1,j-1)$$

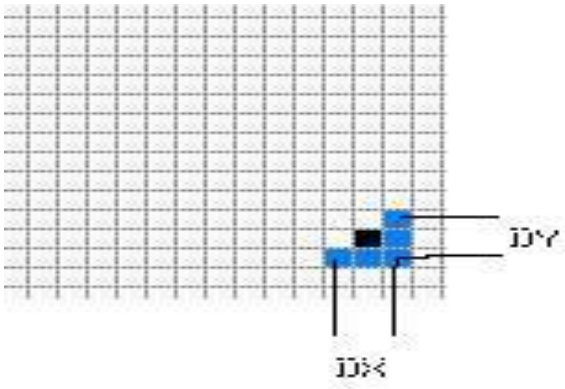

Image 4 Differential in X and Y Directions

Diagonal re-sampling uses the value for seed pixel is calculated from the four surrounding pixels by weighting the differences among the nearest neighborhoods. Probably the most basic form of interpolation is neighborhoods, as the actual pixels are proportionally copied to the position of seed pixel which color depends upon the nearest neighborhood colors. With the most basic interpolation, just copy the approximately similar color values as nearest pixels have. Fill the patch area with black color or suppose the seed pixel is colored with 0 initially. We choose the pixels from right and below from the seed pixel. It is a good algorithm in which nearest neighbor that takes the gradual transition of pixel color value by finding the slope relatively in both directions for over all image enhancements.
Initial condition when we start interpolation just based on difference of color in neighborhood is shown in image-7.

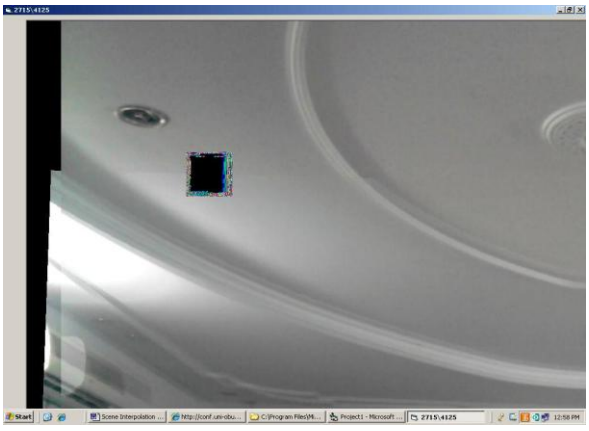

Image 5 Beginning Step for Interpolation

Now we will discuss diagonal differences among the nearest pixels as shown in the Image-8.

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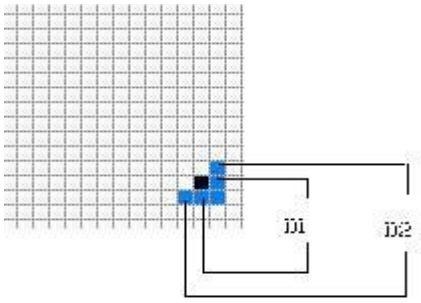

Image 6 Diagonal Differences Among Neighborhoods.

Result of experiment when we use diagonal differences on the missing area filling shown in Image-9. where
D1=P(i+1, j)-P(i, j+1) and
D2=P(i+1, j-1)-P(i-1, j+1)

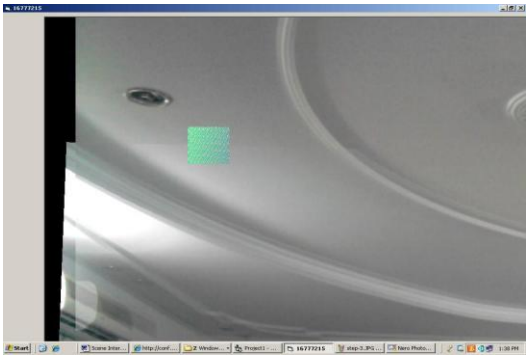

Image 7 Image Interpolation Based on Diagonal Differences comparison.

When these two types of experiments are interpolate with divided difference then the result is as shown in the Image-10. This result is more accurate to match the differentials of nearest neighborhoods.

Image 8 More Accurate Result of Interpolation

Result and Discussion

We have another example which has two patches. And there is a resulted image where one patch is interpolated. These resulted images taken from the experimental application.

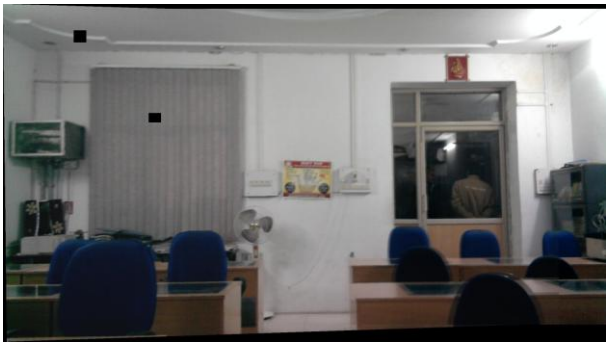

Image 11 before Interpolation

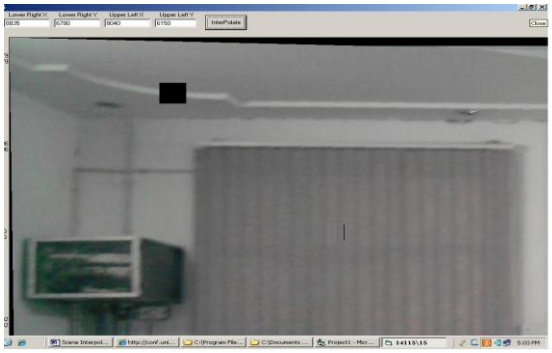

Image 9 after Interpolation

Code segment implemented in VB6, related for the above interpolation scheme is shown in the Image-13.

```
Private Function InterPolation(ax As Double, ay As Double, bx As Double, by As Double)
Dim i, j, Yt, Xt As Double
i = ax
While i > bx
j = ay
    While j > by
        Xt = (Picture1.Point(i - 1, j + 1) - Picture1.Point(i + 1, j + 1))
        Yt = (Picture1.Point(i + 1, j - 1) - Picture1.Point(i + 1, j + 1))
        If Xt < 0 Then
            Picture1.PSet (i, j), (Picture1.Point(i, j + 1))
        ElseIf Yt < 0 Then
            Picture1.PSet (i, j), (Picture1.Point(i + 1, j))
        ElseIf Xt >= 0 Then
            Picture1.PSet (i, j), (Picture1.Point(i - 1, j + 1))
        ElseIf Yt >= 0 Then
            Picture1.PSet (i, j), (Picture1.Point(i + 1, j - 1))
        End If
    j = j - 1
    Wend
i = i - 1
Wend
End Function
```

Image 13 Code Segment For algorithm.

Conclusion and Future Scope

Image processing has become an integral part of our everyday. It is the important step to higher level image processing to interpolate image. It is required in multiple tasks like to enlarge the image, to reconstruct the scene and to visualize the huge area. Interpolation helps to reduce a large

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collection of images in one image for better visualization about any environment. Scene interpolation is the drastic idea to complete the view and avoid the missing scene representation.

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