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Image Matting Based On Weighted Color and Texture Sample Selection

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ABSTRACT

Color sampling based matting methods find the best known samples for foreground and background colors of unknown pixels. Such methods do not perform well if there is an overlap in the color distribution of foreground and background regions. Furthermore, current sampling based matting methods choose samples that are located around the boundaries of foreground and background regions. The contribution of texture and color is automatically estimated by analyzing the content of the image. The method uses texture to complement color in extracting accurate mattes in images when foreground and background colors overlap. This is handled by designing an objective function that uses weighted contribution of color and texture information to select the best (F,B) pair for unknown samples. The final matte is further refined using conventional Laplacian method. The image quality enhancement parameters applied to matting image to produce high visual quality output.

Key words: Alpha matting, trimap, color sampling.

INTRODUCTION

Matting defines the problem of accurate foreground estimation in images and video .It is one of the key techniques which are used in many image editing and film production applications. Exactly separating a foreground object from the background involves determining both full and fractional pixel coverage also known as digital matting. Porter and Duff established this problem mathematically. They presented the alpha channel as the means to control the linear interpolation of foreground and background colors for anti-aliasing purposes when reducing a foreground over an arbitrary background.

In the existing method color sampling based matting method is used. It relies on texture information to discriminate between known regions when they have overlapped color distributions but it fails to extract high quality mattes when known region have both similar colors and textures a new sampling based matting method is presented which avoids missing true samples by collecting a comprehensive set of foreground and background samples. This collection included highly correlated local samples and does not restrict the samples to be near the boundaries of known regions by considering global samples as well. The method uses texture to complement color in extracting accurate mattes in images when foreground and background colors overlap. This is handled by designing an objective function that uses weighted contribution of color and texture information to choose the best (F,B) pair for unknown samples. The weights corresponding to the contribution of color and texture are determined using an automatic content based method. The final matte is further refined using conventional Laplacian method.

Literature survey

Ruzon and Tomasi (2001) described the problem of extracting an image region from the Background which has no general solution. The film and video industries used tool which provided manual control over the extraction process, when the background is constant color. Finally they presented a tool for extracting image regions from almost arbitrary backgrounds. The results showed that foreground objects can removed to new images. A close examination showed some defects since the colors are not properly separated or since the color representation is not precise enough.

Yu *et al* (2001) developed a Bayesian approach .It is solving several problems: constant-color matting, difference matting, and natural image matting. This approach is differs from Ruzon and Tomas's algorithm. There are number of key aspects; specifically, it used in (1) MAP estimation in a Bayesian framework to optimized F and B at the same time, (2) oriented Gaussian covariance for better color distributions, (3) a sliding window to construct neighborhood color distributions which is included previously computed values, and (4) a scanning order that march towards the inside from the known foreground and background regions.

Wang and Cohen (2006) described the MSE curves of different types of algorithm for once test image. Most of the algorithms had achieved their best performance with the finest trimap. If trimap became coarser, their performances generally degraded, at different rates. They also showed partial mattes at two trimap levels because MSE values did not always correlate exactly with visual quality. This algorithm gave the best result among all the trimap levels, both quantitatively and visually.

Levin *et al* (2009) assumed that smoothness in foreground and background colors, it did not assume a global color distribution for each segment. These experiments had demonstrated that our local smoothness assumption often holds for natural images.

Bai and Sapiro (2008) presented a geodesics-based algorithm which is used for natural image, 3D, and video segmentation and matting. They introduced the framework for still images and extended it to video segmentation and matting, and 3D medical data. They added constraints to the distance function in order to handle objects that cross each other in the video temporal domain. We showed examples illustrating the application of different types of images and videos, included videos with dynamic background and moving cameras.

Lee *et al* (2009) described a temporally coherent method of video matting .It extended 2D image matting to 3D. By using spatial and temporal axis, it generated temporally as well as spatially coherent result.

Rhemann1*et al* (2009) described a new approach for color modeling that predicted a pixel wise alpha matte and forms the data terms. They exploited information from global color tools to find better local estimates for the true fore- and background colors for a mixed pixel images. A novel sparsity prior was presented .It showed that pushes á towards 0 or 1 in the vicinity of solid foreground boundaries. The mattes showed this approach considerably improves on state-of-the-art methods.

Chen *et al* (2012) described the various preserved alpha matte. It is actually nonlocal soft constraint on the alpha matte. They combined it with the local soft constraint from the matting Laplacian and also plain data term from color sampling for original image matting. This is a graph model based method and it has closed-form solution.

Outline of proposed work

Binarization

Binarization is a technique of transforming grayscale image pixels into either black or white pixels by selecting a doorstep. The process can be successful using a multitude of techniques. Binarization is achieved compared with other image processing techniques.

A binary image is a digital image. It has only two possible values for each pixel. The two colors used for a binary image are black and white though any two colors can be used. The color which is used for the object(s) in the image is the foreground color while the rest of the image is the background color. This is often referred to as bitonal in document scanning industry. Binary images are called bi-level or two-level. It means that each pixel is stored as a single bit (0 or 1). The names black-and-white, B&W, monochrome or monochromatic are often used for this concept, but may also designated any images that had only one sample per pixel, such as grayscale images. In photo editing, a binary image is the similar as an image in "Bitmap" mode.

A binary image can be stored in memory as a bitmap, a packed array of bits. A 640×480 image required 37.5 KB of storage. Because of the small size of the image files, fax machines and documentation solutions usually used for this format. Mainly binary images also compress well with simple run-length compression schemes. Binary images can be understood as subsets of the two-dimensional integer lattice.

Color sampling based methods

Color information is influenced by color sampling-based matting methods to find the best known samples for foreground and background color of unknown pixels. Such methods did not perform well if there is an overlap in the color distribution of foreground and background regions because color cannot distinguish between these regions and hence, the selected samples cannot reliably estimate the matte. Likewise, alpha propagation based matting methods may failed when the affinity among neighboring pixels is reduced by strong edges.

Mapping estimation

This contribution is integrated into a compositing equation in the form of opacity *á* of a pixel; the equation state that observed color value of a pixel as a convex combination of machines.

$$I_z = \alpha_z F_z + (1 - \alpha_z) B_z$$

Foreground (*F*) and background (*B*) colors and is given by where *Iz, Fz* and *BZ* are the observed, foreground and background colors of pixel *z*, respectively. The opacity, *á*, taken value in the range [0, 1], with 0 indicating that the pixel is from the background and 1 indicating that it is from the foreground. Estimating the digital matte is useful in image and video editing tasks such as background replacement. As seen from equation extracting the matte is a highly ill-posed problem since it included estimation of seven unknowns for each pixel from three compositing equations one for each color component.

TRIMAPS

The problem is restricted using assumptions on image stationary or by using trimap that partition the image into three regions - known foreground, known background and unknown regions; this last region consists of a mixture of background and foreground colors. The trimap could be drawn by the user, or generated automatically or semi-automatically.

Sample selection

Some samples are collected from known foreground and known background regions and the best sample that represented the true foreground and background colors of an unknown pixel is estimated by optimizing an objective function.

Color sampling approaches

Color sampling methods can be further sub-divided into parametric and non-parametric methods. Parametric sampling methods well a parametric statistical model to known foreground and background samples and then estimated alpha by considering the distance of unknown pixels to known foreground and background distributions. Nonparametric methods included simply collect a set of known *F* and *B* samples to estimated alpha matte by finding best samples for unknown pixels. The quality of extracted matte degrades when the true foreground and background colors of unknown pixels are not in the sample sets. Hence, the main advantages are to select a comprehensive set of known samples that included the different *F* and *B* colors in the image.

The affinity matrix that instructed the local correlation of pixels is used in random walk matting, Poisson matting, Closed-form matting and Nonlocal matting.

The statement of large kernels by Nonlocal matting and local color line of "A closed-form solution to natural image matting" are ease in

KNN matting using nonlocal principles and K nearest neighbor.

Image enhancement

Image enhancement operation improved the quality of the image and it can be used to recover the image contrast and brightness characteristics, cut the noise content, and/or sharpen its details. Image enhancement methods may be grouped as either subjective enhancement or objective.

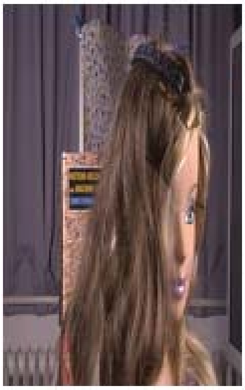
Subjective enhancement method may be repeatedly applied in various forms until the observer feels that the image defers the details necessary for particular application.

Objective image enhancement accurate an image for known degradations. Here distortions are known and enhancement is not applied arbitrarily. This enhancement is no constantly applied but applied once based on the measurements taken from the system. Image enhancement falls into two wide categories: Spatial domain technique domain technique. Spatial domain referred to the image plane itself, where approaches in this category are based on direct manipulation of pixels in an image. Also, spatial domain referred to the total of pixels composing an image.

Frequency domain processing methods are based on changed the Fourier transforms of an image. Image enhancement means "making an image more colorful for human vision". Fingerprint recognition is used in distinct individuals for a long time and it is the most popular method in biometric authentication currently. As a result, no single standard technique of enhancement can be said to be "the best". Nearby, the nature of each image in terms of distribution of pixel values will change from one area to another frequency

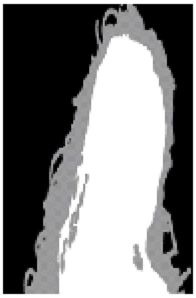
RESULTS

The peak signal-to-noise ratio (PSNR) and mean square error (MSE) used to obtain the qualitative results for comparison. The MSE represented the cumulative squared error between the enhanced and the original image.

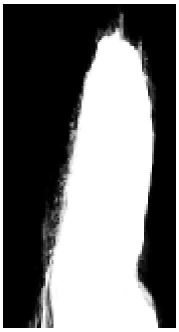


Input Image

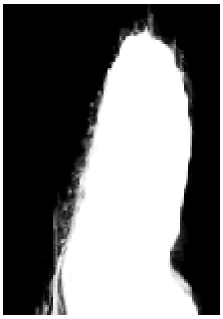
Cropped Image



Trimap Image



Existing Output



Proposed Output

Parameters Reading

Parametr Reading	Existing Work	Proposed work
Peak signal to noise Ratio(PSNR)	14.0932	14.5795
Mean square error(MSE)	2.5337e+03	2.2653e+03
Normalized cross correlation(NCC)	0.9483	0.9559
Normalized absolute error(NAE)	0.1795	0.1824

MSE (Mean Square Error) and PSNR (Peak Signal to Noise Ratio) are some of the image quality assessment parameters which are calculated at the concluding stage of the project.

This was calculated in order to prove that the algorithm/ techniques used in project was superior to the existing one.

The MSE and PSNR are calculated to evaluate the processed image.

CONCLUSION

The image quality enhancement parameter is applied to the image to get a better quality image. The higher value of PSNR, the better quality of the reconstructed image.

Future scope

Adaptive histogram equalization (AHE) is a computer image processing technique which is used to improved contrast in images. It differs from ordinary histogram equalization. The adaptive method computes several histograms. It is therefore suitable for improving the local contrasts. However, AHE has a tendency to over amplify noise in relatively homogeneous regions of an image. A variant of adaptive histogram equalization called contrast limited adaptive histogram equalization (CLAHE) prevents this by limiting the amplification.

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