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Image Blending and its Importance in Image Processing

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ABSTRACT

Digital image processing has a broad spectrum of applications in today's modern world. Image processing is the use of computer to process pictures, a technique that has revolutionised in the fields of medicine, geology and space exploration. It has become the hottest area in digital signal processing. In this paper, different techniques used in image processing and its applications are introduced. The brief introduction of mixing of two images, which is known as blending, and its usage in different areas like medical imaging, biological research, seismic data interpretation, film industry and photography are presented in this paper.

Keywords: Digital image processing, mixing, blending, medical imaging

I. INTRODUCTION

Nowadays, image processing is a rapidly growing technology. It forms one of the core research area in engineering and computer science field. It basically includes three stages. First, image capturing through image acquisition tools and second, analyzing the same and finally followed by the output stage called the processed or altered image. There are two types of image processing namely, analogue and digital image processing. Analogue image processing is used for hard copies such as printouts and photographs. Manipulation of digital images through computers are done with the help of digital image processing techniques. Various phases of digital image processing are image acquisition, image pre-processing, image enhancement, image segmentation and image classification. Image blending is one of the application of image processing applied in various fields such as, medicine, biological research, photography, film industry, geography and many more areas. The organization of paper is as follows - section II briefly introduces image processing and its techniques, section III provides its applications and this is followed by blending application and its different types in section IV.

II. IMAGE PROCESSING

In modern science and technologies, images are gaining broader scopes, because of ever growing importance of scientific visualization. Image processing usually refers to digital image processing techniques, like to process, to analyze and to present the images obtained from various sources, such as Microscope, Digital camera, Scanner etc. into suitable form. Nowadays, manufacturer of microscopes designs their instruments with features supporting image processing.

A. Image Processing Techniques

There are various Image Processing techniques. Following are the different types of techniques:

- ✓ Image Acquisition (capturing) is done through ultrasound, magnetic resonance imaging(MRI), computed tomography(CT), and electrical tomography
- ✓ Image Pre-processing: Image data recorded may restrain errors due to brightness value of the pixels and enabling to approach Image pre-processing.
- ✓ Image Enhancement involves using the techniques to improve visual impact, such as size, shape, color, and texture features better suited for either human or for machine interpretation
- ✓ Image Segmentation: Image segmentation is the process which subdivides the image into its constituent parts. For Image segmentation, different techniques are used, which includes Image thresholding-based technique, Image gradient-based technique and region-based technique.
- ✓ Image classification is classifying a pixel or group of pixels based on its grey value, which aides in extracting the information about the image.

III. APPLICATIONS OF IMAGE PROCESSING

Image Processing is used in various applications such as Medical Imaging, Biological research, Cancer research, Drug testing, Metallurgy, Film Industry, Graphic Arts, Printing Industry, Forensic studies and Material science.

In Medicine, extraordinary evolution of image acquisition technology enables physicians to deal with several kinds of images for the medical diagnosis. Medical images coming from different sources can often provide different information. Combining two or more co-registered multimodal medical images into a single image (image fusion) is an important support to the medical diagnosis.

In case of cancer tumor diagnosis, it involves capturing number of high-resolution smaller component images and later combining these smaller high-resolution component images to get a complete panoramic image of cancer tumor.

IV. IMAGE BLENDING

Image blending is a technique of blending or mixing two or more images to form a single merged image. It is similar to pixel addition. The value of each pixel in the output image is a linear combination of the corresponding pixel values of the input images. Here, the first image in the process of overlaying is called as upper or top layer and the second image which is blended with the first image is called as lower or bottom layer.

A. Different types of blending

- ✓ Normal blend mode is the standard blend mode which uses only the upper layer and does not mix colors with the bottom layer.
- ✓ In Dissolve blend mode, the pixels are taken randomly from the both the upper and lower layers. For high opacity most of the pixel would be taken from the upper layer and for the low opacity most of the pixel will be taken from the bottom layer. Due to this the image may look grainy.
- ✓ Multiply and Screen blend modes are very basic blending modes which are used for darkening or lightening the images.
- ✓ In Multiply mode, values of the pixels from the top layer are multiplied with the respective pixel values from the lower layer. The result is a darker image.
- ✓ In Screen mode, the values of pixels of two images are first inverted and then respective pixel values from both the images are multiplied. Finally, the lighter image is obtained by inverting the multiplied value.
- ✓ The Simple Arithmetic blending modes are division, addition and subtraction mode.
- ✓ In Divide blending mode, the respective pixel values of the one-layer divides with the pixel values of another layer. It is useful for making

the image brighter in case of grey image and helps in removing the tint of a colors in colored images.

- ✓ In Addition blending mode, the pixel values of both the images are added. If the value is above 1, the resulting image is white. If the pixel value is below 0, the resulting image is black.
- ✓ In Subtract blending mode, respective pixel values of the layers get subtracted. If the resulting value is negative then the image is black.
- ✓ The function of the Hue blend mode is to retain the luma and the chroma of the bottom layer of the image, while adopting the hue of the upper layer.
- ✓ In Saturation blend mode, it retains the luma and hue of the lower layer and adopts the chroma of the upper layer.
- ✓ In Luminosity blending mode retains the hue and chroma of the lower layer and adopts the luma of the upper layer.

Applications of Image blending

In Medical Diagnosis, a Computer Aided Diagnostic Systems helps in early diagnosis, monitoring and treatment for the ailment. This is where the medical imaging plays a vital role, where image blending plays its subsystem. As it is known, a complete panoramic image of the clinical diagnosis cannot be taken in single scan, component images will be stitched and blended to form a composite image aiding better clinical diagnosis. In geography, color and color blending plays a critical factor in seismic data interpretation. Mobile application like panoramic view makes use of Image Blending and Stitching. Once the image size goes beyond threshold limit, an image pyramid is considered.

An image pyramid builds multiple mosaics of images each one at a different zoom level, resulting in tiles, where each tile is stored in a separate file. This comes with a composition overhead to bring back the tiles into a single image. It can speed up image handling as each overview is tiled, and thus a sub-set of it can be accessed efficiently. A mosaic of these images can be accurately formed by applying image registration (stitching), overlap removal and blending techniques. For this an optimized, automated, fast and reliable method for both image joining and blending algorithms can be applied.

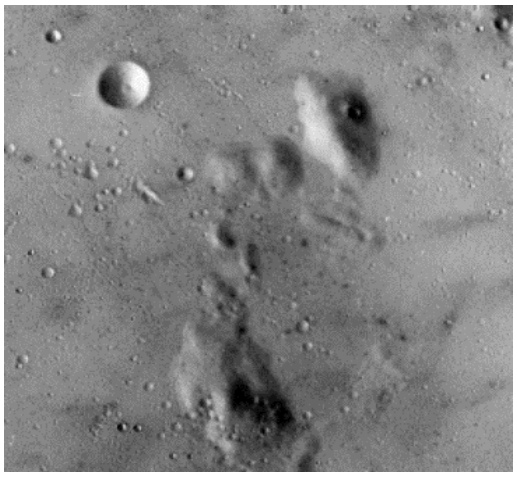

Figure 1. First image

Figure 2. Second image

Figure 3. Blended image

Figure 3 is the resulting image obtained by blending figure 1 and figure 2. Blending of images is calculated using the formula,

$$Q(i,j) = X \times P_1(i,j) + (1 - X) \times P_2(i,j)$$

where P1 & P2 are two input images, Q is the resulting image. X is the blending ratio which determines the influence of each input image in the output. This happens if the images are coloured. X can either be a constant factor for all pixels in the image or can be determined for each pixel separately using a mask. The size of the mask must then be identical with the size of the images. Here, P1 is the first image called as upper or top layer and P2 is the second image which is blended with the first image called as lower or bottom layer.

V. CONCLUSION

Currently, Image processing is one of the major areas in medical science to diagnose ailments. In this paper, different techniques used in image processing and its applications are introduced. Mixing of two or more images to get single image is called blending. Image blending plays a major role in medical imaging, seismic data interpretation, mobile applications, film industry and photography. A sample of blending two images is briefly introduced in this paper.

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