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Lab Image and Field Image Contrast Quality Differentiation

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Abstract: ***Image processing performance can be improved with the process of resizing the original input image to one standard size. Most of the previous studies used a standard size of 256 x 256 to provide the image as the image pre-processing material. The result of different image size dimension are shows in this research to proven that image resizing is important. Reducing image dimension size can help to improve system performance. At the same time, it is importance to keep the image quality. This study shows that by reducing image dimension, it can improve the computer or system performance more than 95%. Image quality can be measured to get helpful information for the study after resizing the image into the same standard size. In this study, measurement of contrast levels was taken to compare the quality differences between image labs and field images. It turns out that the quality of lab image produces high-quality images with good brightness over image field image.The best quality image is the images that have low contrast. Therefore in this research paper we used CLAHE method to enhance the contrast and brightness for field image.***

Keywords: Contrast; Clahe; Image Quality

I. INTRODUCTION

Image resizing is necessary when you need to increase or decrease the total number of pixels. (Bhange & Hingoliwala, 2015)In research, image where sets to same size to have a standard result. The procedure of standardizing the size of an image is important to ensure that the computer can easily read and process the output of image accurately.At the same time, the image did not harm or reduce in quality.(Lam, Cladière, Guillaume, Wassmann, & Bolte, 2017).

Lab image is a collection of image captured in lab with proper camera or equipment setting.

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In this research, lab images collection is used from Leafsnap.com which is this pressed leaves were captured with same setting, sharpness, light. These lab images was snap backlit and front-lit from different samples of species.

The images are consistency with low contrast and contains of high in light. Field image is a collection of image captured in the field with many exposures. This image need heavily on algorithms to correct the color and brightness of the image captured by the different sensor. (Qureshi, Beghdadi, & Deriche, 2017)

Contrast is the difference in colour or luminance of properties in which the representation of a display or an image is made distinguishable. Every object, even in the same field of view, can have distinctive values of brightness and colour. A high contrast image can be defined as the brighter image in which the character of an image is easy to recognise and to extract. While a darker image will have bad contrast value, it cannot deliver as much information. (Albahari, Madzin, Roff, & Noor, 2018)

Image Enhancement can improve the quality factor of low resolution in field image with bad contrast value. CLAHE is a solution for the alteration of image brightness. This method proved that it could produce better quality and contrast stretching that helped to enhance the image quality. (Zheng, Shi, & Sun, 2017)(Singh & Patel, 2018)

II. MATERIALS AND METHODS

In this paper, three different image dimension are measured, which are 256 x 256, 512 x 512 and 1024 x 1024 were applied to 100 randomly picked digital leaf field images.Contrast quality comparison has been measured between 300 images of 100 randomly picked digital leaf lab image and 100 field images from Leafsnap and 100 additional images collection from this research database captured using different devices. The result shows below is the sample from all of these output.

Database

Lab images and field image used in this study were obtained from the Leafsnap dataset online repository developed by a group of researchers from Columbia University. The collection of lab images consists of images taken in proper lab setup. (Kumar et al., 2012)These images have high resolution, low contrast and sharp view. The collection of field images consists of images taken by mobile equipment in outdoor environments. Due to the environmental aspect, these images have low resolution, high contrast, noise, and are sometimes blurred. The total dataset used for this research is 300 images.

The dataset used is 100 lab images, 100 field images from Leafsnap and additional 100 field images from own database collection. Figures in section 3 shows a few examples of the images used in the experiment.

All the images were standardised to a resolution of 256 × 256 pixels. The processing or transmission time of such digital images was shorter and also archived an acceptable amount of data generated.

Experimental Setup

The experiments were conducted to process a collection of lab images and field images to compare the values using the size capacity in Kilobyte (kb) and the Contrast (C). Two different preliminary experiments were supervised using the resizing method and contrast measurement method. The algorithm was implemented and run using MATLAB software on a computer with Intel Core i7 processor (2.75 GHz, 16.0 GB RAM) and Windows 10 Professional operating system.

Application of Resize and Contrast Technique

The original input images size was 4000 x 4000 pixels. This original images was resized into 3 different size,which are 256 x 256, 512 x 512 and 1024 x 1024. Image resizing can reduce the time consuming in the process of image pre-processing. Resizing image is importance to standardize the image size and compute the result from same dimension of image. By resizing an image, the memory used in computer is more efficient and save the storage capacity.

Second preliminary experiment was contrast comparison between lab image and field image. In this research, contrast quality measurement is compared to show the quality differentiate between these two types of image collection. The original image is measured as is without any manipulation to count the brightness in the images. The lab images has stretched histogram and the magnitudes were better distributed compared to field images. The field image has higher contrast value and hide valueable information.(Li, Guo, Cong, Pang, & Wang, 2016).

Evaluation

The original input lab images and field images from leafsnap and field images from this research database was measured to obtain the contrast quality value. The result were evaluated to compare image contrast quality result to each other. This comparison could prove the quality value in which images and show the statistics of the contrast (C) value from each categories. (Syrris, Ferri, Ehrlich, & Pesaresi, 2015)

III. RESULTS AND DISCUSSION

In this section, the comparisons between different image sizes are presented. The sample of an image below in figure 1 shows different file of image with different dimension. After the process of setup to different dimension, the output images shows that this processdid not affect the quality of the image and carrying the same information as actual original image. However, the measurements of size in kilobyte are different as shows in table 1.

Image name	Dimension			Image name	Dimension			Image name	Dimension		
	256 X 256	512 X 512	1024 X 1024		256 X 256	512 X 512	1024 X 1024		256 X 256	512 X 512	1024 X 1024
Leaf 1				Leaf 2				Leaf 3			
Size	5.5 kb	15.4 kb	45.8 kb		4.0 kb	10.8 kb	34.0 kb		4.7 kb	15.4 kb	53.5 kb

Fig. 1 Sample of Image with different dimension.

The result shows in table 1 below and the graph illustrated in figure 2 shows that the result of image dimension after the process of image resize is done. It shows that the size in kilobytes is reduced .This process did not affect the image information and the data contains in an original image is remain. Small capacity size of an image can reducecomputer processing time more efficiency and reduce the usage of computer memory.

Table. 1 Image Size Capacity Analysis with different size of dimension for Image from Leafsnapdatabase.

Image name	Image Dimension			Image name	Image Dimension			Image name	Image Dimension		
	256 X 256	512 X 512	1024 X 1024		256 X 256	512 X 512	1024 X 1024		256 X 256	512 X 512	1024 X 1024
	Size in kilobytes				Size in kilobytes				Size in kilobytes		
Leaf 1	5.5	15.4	45.8	Leaf 11	5.4	16.2	51.1	Leaf 21	6.2	19.6	62.3
Leaf 2	6.1	17.8	51.7	Leaf 12	5.2	16.4	52.5	Leaf 22	5.2	16.7	52.7
Leaf 3	6.2	17.6	51.2	Leaf 13	5.3	16.7	53.2	Leaf 23	4.8	15.1	48.0
Leaf 4	6.3	18.1	52.9	Leaf 14	5.4	18.5	60.5	Leaf 24	5.7	18.8	60.2
Leaf 5	5.4	15.5	45.9	Leaf 15	4.8	15.7	54.4	Leaf 25	4.4	13.5	44.9
Leaf 6	4.0	10.8	34.0	Leaf 16	4.7	15.4	53.5	Leaf 26	5.8	18.8	58.8
Leaf 7	4.0	10.7	33.6	Leaf 17	4.3	13.1	43.5	Leaf 27	5.4	17.0	55.4
Leaf 8	4.3	11.6	35.8	Leaf 18	4.1	13.2	43.9	Leaf 28	6.1	18.8	59.2
Leaf 9	4.2	11.2	34.9	Leaf 19	4.5	15.7	53.3	Leaf 29	5.3	18.2	59.5
Leaf 10	4.0	10.7	34.0	Leaf 20	5.1	16.2	52.6	Leaf 30	4.8	16.0	55.1

The graph obtained for Difference Dimension for these images is shown in figure 2 below:

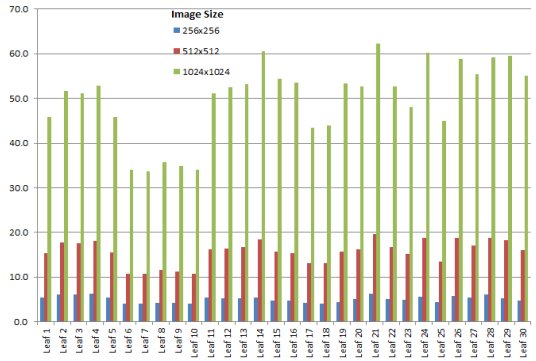

Fig.2 Size Capacity Analysis

In this section, the result of contrast quality measurement from the original input lab image and field images experimental results are presented. These contrast result were compared to show the difference between lab image and field image in image quality value.(Seo & Jeon, 2016) (Agarwal & Mahajan, 2017) The contrast measurement is the technique used to compare the contrast of the lab images and field images. The images in Figure 3were the lab image from Leafsnap. The images in Figure 4 were the field images from Leafsnap and the images in Figure 5 were the field images from own database which are captured by using typical devices such as mobile phones with various ranges of sharpness and setting.

Fig. 3 Sample of Lab Image FromLeafsnap.

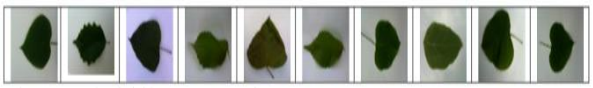

Fig. 4 Sample of Field Image FromLeafsnap.

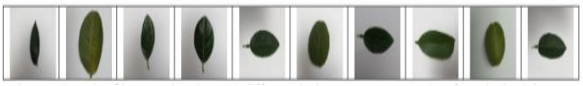

Fig.5 Sample of image using three (3) different devices. Images were taken fromdevice iphone smartphone, Lenovo smartphone and Xiomi MiA2 dual camera smartphone.

The comparison of the contrast result is shows in table 2. The contrast measurement analysisbetween lab image, field image from Leafsnap database and field image from own database collection using different device is shows in figure 6. Sample of Image from own research collection using three (3) different devices. These images were taken from device iphone smartphone, Lenovo smartphone and Xiomi MiA2 dual camera smartphone.

The comparison of the different types of image shows that the lab images have better value range in the image contrast index.Thecontrast measurement shows that the contrast and brightness values in lab images are much lower than field images.

Table. 2 Contrast Measurement Analysis between Lab Image, Field Image from Leafsnap database, Field Image from own database collection using different device, and CLAHE enhancement Field Image.

	Contrast					Contrast			
Image name	Lab Image; Leafsnap	Field Image; Leafsnap	Field Image; Own database	CLAHE Enhanced Field Image	Image name	Lab Image; Leafsnap	Field Image; Leafsnap	Field Image; Own database	CLAHE Enhanced Field Image
Leaf 1	0.10165	0.4656	0.4730	0.4454	Leaf 16	0.18312	0.4439	0.4427	0.3774
Leaf 2	0.10911	0.5222	0.5250	0.4943	Leaf 17	0.18917	0.4173	0.4233	0.3924
Leaf 3	0.12033	0.443	0.4498	0.4224	Leaf 18	0.13665	0.333	0.3404	0.2752
Leaf 4	0.08539	0.4398	0.4455	0.4449	Leaf 19	0.12915	0.3919	0.3968	0.3130
Leaf 5	0.07788	0.4729	0.4730	0.4301	Leaf 20	0.12913	0.4422	0.4512	0.4107
Leaf 6	0.12728	0.3006	0.3174	0.2583	Leaf 21	0.13792	0.4626	0.4554	0.4215
Leaf 7	0.11829	0.2901	0.3042	0.2492	Leaf 22	0.14402	0.4998	0.5043	0.4296
Leaf 8	0.15548	0.3259	0.3382	0.2809	Leaf 23	0.12654	0.4211	0.4243	0.3677
Leaf 9	0.16353	0.3211	0.3394	0.2855	Leaf 24	0.13346	0.525	0.5318	0.4791
Leaf 10	0.16077	0.3094	0.3291	0.2583	Leaf 25	0.14867	0.3946	0.4024	0.3398
Leaf 11	0.14176	0.52	0.5146	0.4423	Leaf 26	0.14258	0.4651	0.4736	0.4641
Leaf 12	0.10423	0.4574	0.4700	0.4246	Leaf 27	0.15581	0.5212	0.5240	0.4866
Leaf 13	0.09862	0.5079	0.5082	0.4471	Leaf 28	0.16385	0.4391	0.4364	0.4052
Leaf 14	0.14945	0.3812	0.3842	0.3335	Leaf 29	0.14575	0.501	0.5061	0.4172
Leaf 15	0.10512	0.4203	0.4243	0.3640	Leaf 30	0.15556	0.4187	0.4256	0.3732

The graph obtained for Contrast Quality Measurements for these images is shown in figure 6 below:

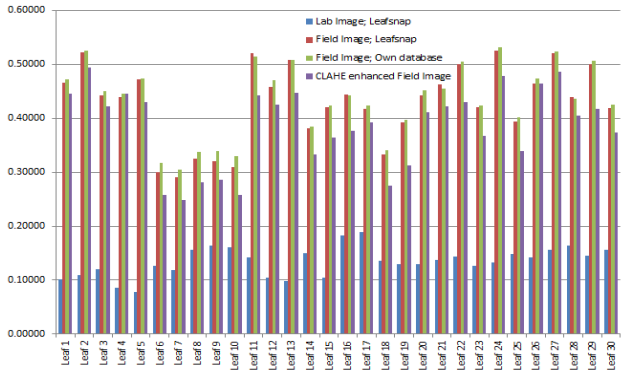

Fig. 6 Contrast Value Analysis

IV. CONCLUSION

This study identifies the effectiveness of resizing the image of an original picture into a study. It turns out that large-sized image images make it difficult to process images during the pre-processing process. Large images cannot be processed or shown in processing tools because the size is too heavy to process. Resizing images is very important to preparing the image to the pre-processing process or further experiments. The findings show that most of the previous studies used a standard size of 256 x 256 to provide the image as the next study material.

Image quality can be measured to get helpful information for the study after resizing the image into the same standard size. In this study, measurement of contrast levels was taken to compare the quality differences between image labs and field images. It turns out that the quality of lab image produces high-quality images with good brightness over image field image.

High-quality images are important in processing agricultural images or extraction process characteristics in each stage of the research. However, lab image require a high cost to provide appropriate equipment and provide tools to ensure that the images obtained are high quality and can provide useful information to researchers. The experimental results indicate that the output from lab image has better contrast brightness and provides more valuable information and meets the image quality factor requirements using contrast measurement.

The experimental results of leaf field image collections showed the effect of the enhancement method. The enhancement method proved that it could produce better quality and contrast stretching was the best technique that helped to enhance the image quality.For future research,

improvement on image enhancements technique is needed to improve image quality for field images. These field images were not suitable to be used in image preprocessing or features extraction due to their bad quality. Furthermore, they could not be used in the recognition system as they provided less information.

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