A Novel Approach on Image Processing using R Studio

K Naga Babu

CSE Department, MVGR College of Engineering, Vizianagaram, India

Abstract: Image processing, it plays an important role in many fields and have its own importance in fields like medical, biomedical, security. The data is increasing massively so the present traditional tools like MATLAB are not sufficient to compute such huge amount of data so, the paper is discussing about such data handling tool i.e., R. R is a tool which is used to analyze the big data. But, till now it is not proven that it can also handle Image processing. The paper is proving how R tool can process the image data and it can also handle huge amount of image data. Two Sample operations such as image stitching and fusion are shown with the R tool.

Keywords: Image Processing, R Studio, Stitching, Fusion, Mosaic.

I. INTRODUCTION

Image Processing is not a new word in present days many researches have been taken place in this platform. Image processing is the technique to covert image graphics and digital form and perform some mathematical operation by using images or video such as a photograph or video frame. It is a type of signal processing in which input is an image and output may be image characteristics .Nowadays, image processing is among rapidly growing technologies. Basically analog and digital are the techniques in image processing. At present digital is the method using in image processing because of its advantages. In image analysis many type tools are used like mat lab, Hadoop[1], python etc. To enhance the image we have operations like Stitching, Fusion and Mosaic. Each method have their own method of implementation to enhance the given input image.In this paper we are going to explain how these methods are going to be implemented in R tool.s

II. RELATED WORK

Yun Zhang has clearly explained about image fusion [2] importance, techniques and limitations. A survey paper by Ebtsam Adel et.al [3] explains about the image feature extraction techniques. Image enhancement using fusion techniques is explained in [4] by Anju Rani. Several works are done in respective area of research using mat lab[5] and complete implementation work is stated in [6] using Raspberry Pi. Methods to improve image enhancement based on image fusion is explained by Fang et.al [7].

III. R TOOL

R is a free and open source integrated development environment. R is a programming language for statistical computing and graphics. It is available in two editions R studio Desktop and R Server. In R Studio program runs locally as a desktop application.

In R Server, allows R Studio using a web browser while it is running on a remote Linux Server. The programming language used for R is C++ and uses Qt framework for its GUI.R Studio contributes many packages which are useful in their respective environment and projects. R users are doing some of the most innovative work in science, education and industry. It's a daily inspiration and challenge to keep up with the community and all its accomplishing. Some of the R packages used in our paper are bmp, raster, png, jpeg, raster, ggplots, rvest, ebimage etc. Approximately we have 10,000 packages in R Studio.

IV. IMAGE PROCESSING

Normal Image Processing involves steps for computing and processing. Methods which are used in normal approach process image one after the other. This increases the processing time and load on the processor. An online available technique uses single system resources such as processor and Operating System. Programming languages like C and Java will process an image but are insufficient for voluminous amount of data.

Image Processing in Mat Lab is time taking and can't be used for large data sets. So, here we come with a solution by using R studio. R studio run on specific packages that are necessary to read and process an image. The code is written in R script which is similar to C++ language.

Image Stitching: To produce a high-resolution image we use Stitching. In this we combine multiple images and overlap the field view to generate a segmented image with high-resolution. To produce seamless results an exact overlapping of the images should be done. This method is widely used in applications like Image Stabilization, Video Stitching, Medical Imaging, Multiple Image super-resolution and Object Insertion. Image Stitching Algorithms mainly focus on three major steps. At first we need to focus on image calibration i.e. it corrects the difference between the ideal lens model and camera lens

combination. Camera parameters are mainly focused. Second step is Image Registration, the process of aligning multiple images from different point of perspective. Last step is Image Blending, in this we apply blending to the image so that image obtained will be seamless. Two major approaches for process of stitching with multiple images are Direct Techniques and Feature-Based Techniques [8]. Image Fusion: The Combination of relevant information of two or more images into a single image is called image fusion. The resulting image is more informative than input images. This increases the quality of the image. Image Fusion is used in many fields such as remote sensing, computer vision, robotics and medical applications. Fusion techniques include method of pixel averaging to more complicated methods such as wavelet transformation and principal component analysis.

Image Fusion methods are divided into two types Spatial Domain Fusion Method and Transform Domain Fusion Method. In Spatial Domain Fusion method we deal with image pixels and manipulate them to obtain desired output. In Transform Domain method Fourier Transformation is applied on the image to get desired output. Some of the primitive methods in Image fusion are Averaging method, Select Maximum and Select Minimum[9]. Image Mosaic: It is a synthetic composition generated from a sequence of images and can be obtained by understanding geometric relations between the images. Image mosaicing requires integration of direct and feature based methods. For overlapping regions, rotations and small transformations we use direct based method. Whereas for corner detection, corner matching and motion parameters & stitching we use feature based methods. The procedure of image mosaicing are to register the image by estimating the homography, wrap the input frames and finally to align them by pasting the wrapped images[10].

V. IMAGE PROCESSING USING R STUDIO

After installing the R Studio download the necessary packages for image stitching and fusion. These packages act as library files to R Studio. The model we use here is Image. It provides general purpose functionality for image processing and analysis. It offers to segment cells and extract quantitative cellular descriptors. This allows the automation of such tasks using the R programing language and facilitates the use of other tools in the R environment for signal processing, statistical modelling, machine learning and visualization with image data. Images are read using the function "readImage" as image or URL. EBImage uses a package-specific class "Image" to store and process images. It extends the R base class "array" and all EBImage functions can also be called directly on matrices and arrays. The results thus obtained by using the functions and required packages are shown below. The second section is the obtained values from mapping pixels in the image to the real line between 0 and 1 (inclusive). Both extremes of this interval [0, 1], are black and white colors, respectively.

Information about the display the image

CODE	VALUE	DESCRIPTION
Color mode	color	The type (color RGB to Grayscale of the image
dim	1984 14883	(x,y,z) are the Dimension of the array
Storage .mode	double	Values in array
nb. render .frames	1	No. of channels
nb. total. frames	3	No .of channels in each pixel, z entry in dim.

Hence, pixels with values closer to any of these end points are expected to be darker or lighter, respectively. And because pixels are contained in a large array, then we can do all matrix manipulations available in R for processing.

VI.GAMMA CORRECTION

Gamma correction is the name of a nonlinear operation used to code and decode luminance or tristimulus values in video or still image systems, defined by the following power-law expression:

$$V_{\rm out} = AV_{\rm in}^{\gamma}$$

range 0-1. A gamma value $\gamma < 1$ is sometimes called where A is a constant and the input and output values are non-negative real values; in the common case of $A = 1$, inputs and outputs are typically in the an **encoding gamma**
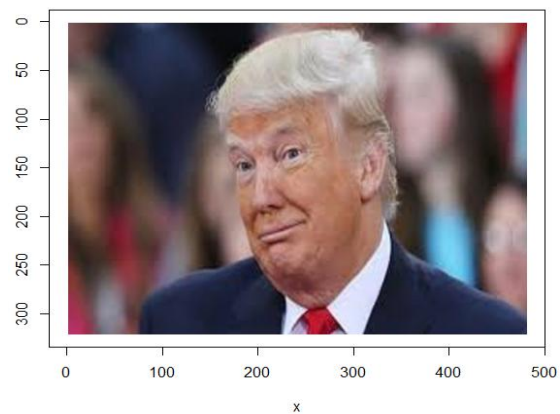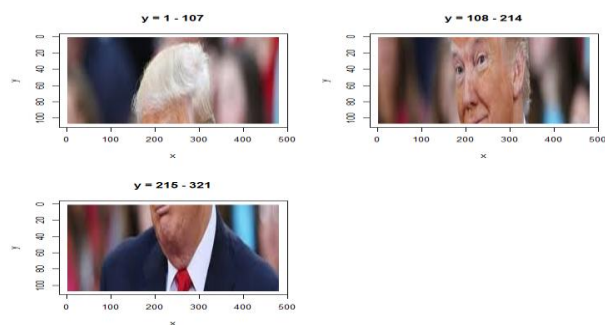

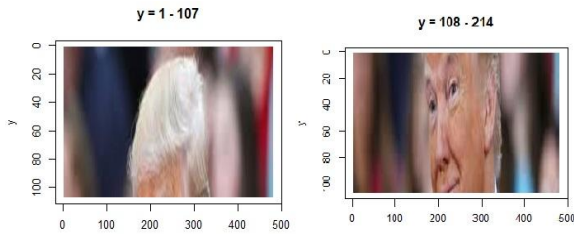Figure 1 Original Image

Figure 2 After applying stitching

Figure 3 splits of an image in horizontal view
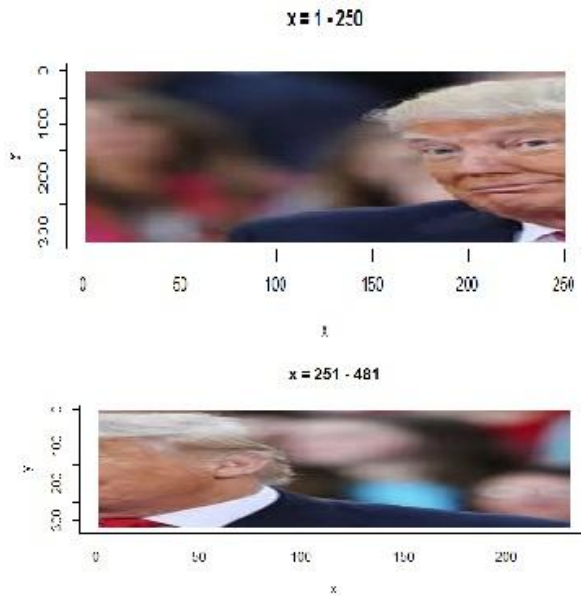

Figure apply the gradient in Y axies

Figure 4 splits of an image in vertical view

VII. IMAGE GRADIENT

In image intensity changes with different type of gradient directional changes in image .In main image editing the term of gradient for color gradient .mathematically the gradient of a two variable function at each point image in 2d vector in the horizontal and vertical direction Image gradient are utilized in map and visual images GIs tools use color elevation and population .
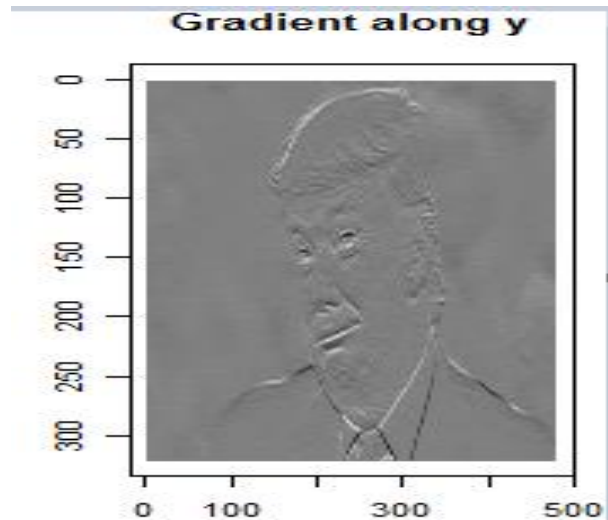
Figure 5 maximum across fusion

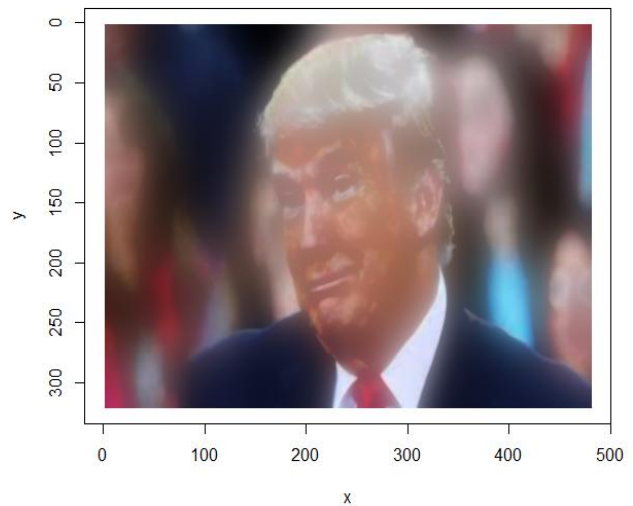Figure apply the gradient in X axies
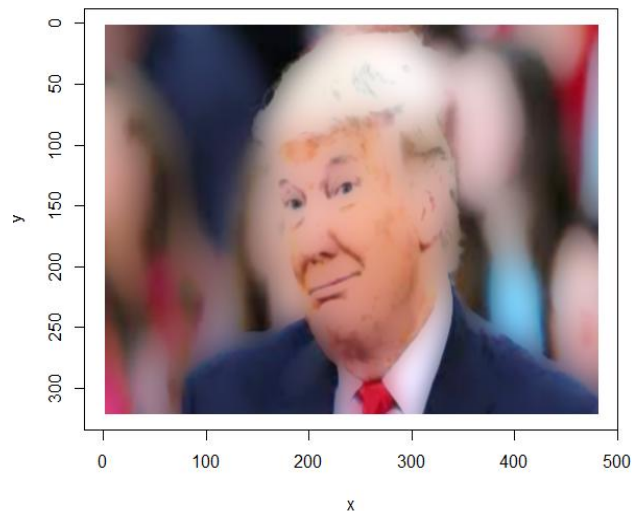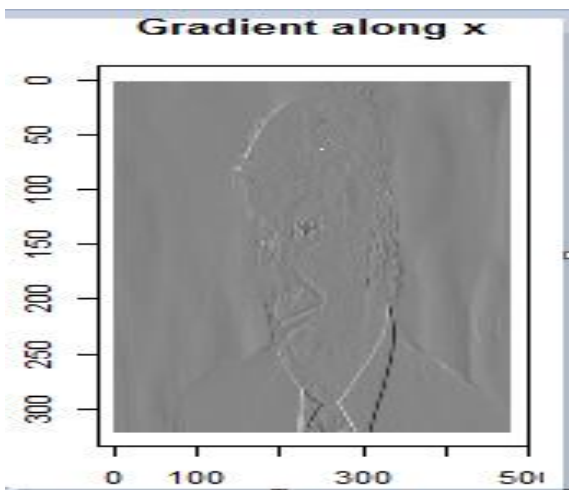

Figure 6 minimum across fusion
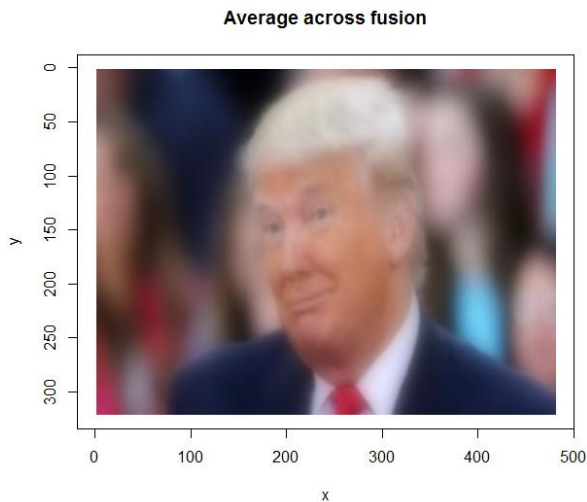
Average across fusion

Figure 7 average across fusion

VIII. CONCLUSION

R is a powerful tool for image processing when compared to traditional tools. Thus, in this paper we are showing results for image processing methods like stitching and fusion using R Studio. Further implementations like noise removal, image edge detection, mosaic, image enhancement etc. can be implemented in R.

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