Digital Image Processing in Various Tools

Prangya Paramita Pradhan, Sasmita Kumari Nayak

Electronics & Instrumenation Dept.
Odisha University of Technology and Research, Bhubaneswar

ABSTRACT: The objective of Image processing is to analyse and manipulate the digital image for improving its quality or to extract some information. Now a days image processing has a vast role in various aspects of companies. Image processing has huge application in pattern recognition, machine learning, IOT etc. So many platforms are there for image processing. Some of them are open source and some of them are licensed version. As this pandemic shows the real use of software, and this scenario the researches also increases rapidly. This paper will give a clear vision about different software for image processing.
Keywords: LabVIEW, MATLAB, SCILAB, Python

INTRODUCTION:

Digital image processing is widely used in Image sharpening and restoration, Medical field, Remote sensing, Transmission and encoding, Machine/Robot vision, Colour processing, Pattern recognition, Video processing, Microscopic Imaging etc.[1]. Digital image processing involves image acquisition, enhancement, restoration, compression, segmentation, representation and description. The same has described in a block diagram in Figure 1.

Now, Digital image processing is a high end research area so for processing a poles apart images. The processing of a digital image like quality enhancement, extraction of useful information, converting to different format etc. can be easier for a two dimensional image if it can represented mathematically[2].Many software options are available which can be describe the image as a mathematical operation. This paper will describe about various tools and Their implementation in Digital image processing.

In this paper section I gives a brief idea on LabVIEW in image processing, section 2 explains Pre-processing of image in MATLAB. Section 3 gives a brief idea on SCILAB in image pre-processing. Section 4 gives a brief idea on image pre-processing in python. Section 5 gives an overview image pre-processing output in different software. Section
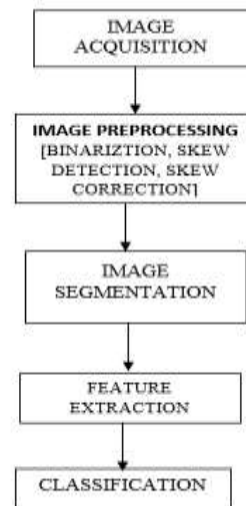

Figure1. Steps involved in Digital image Processing.

I. LabVIEW: Laboratory Virtual Instrument Engineering Workbench(LabVIEW) is an environment for visual programming language from NI. The Graphical programing language "G" is used in LabVIEW[3]. It is commonly used in data acquisition, communication engineering, Automation, variousdesign of filters, Biomedical signal processing, and Image processing, Industrial automation etc. It can be used in various platforms like Microsoft Windows, UNIX, Linux and Mac OS etc. In LabVIEW the user interfaces is called front panels. InLABview, each sub routines programs are comprised of the three basic components. These components are Block diagram, front panel, connector panel of Virtual Instruments(VI). The latest release of LabVIEW is LabVIEW NXG 5.1 2021/August by NI Microsoft.

Visual analysis aspects of LabVIEW is better as compared other. LabVIEW Vision enables to read/create image Files and provides means for managing those files. Built-in functions (VIs) for

analyzing images. LabVIEW IMAQ vision toolbox contains all the functions of digital images processing and image acquisition system[2]. Which helps to develop a simple visionbased of Image Analysis.
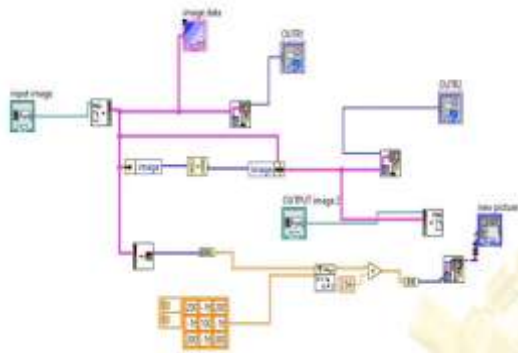

Figure2. Image pre-processing in LabVIEW

II. MATLAB:MATLAB-based technique provides an extensive data analysis,visualization approach, easy implementation and easy debugging. Besides coding, simulation can be implemented for both images and videos[4]. MATLAB having interactive applications that combine direct access to large collections of algorithms with immediate visual feedback. It integrate with Parallel computing environments, GPU and C code generation. MATLAB can interface with programs written in programming languages like C, C++, Java and So on. The MathWorks provides unlimited use of MATLAB and Simulink products. MATLAB was invented by mathematician and computer programmer Cleve Molerin early 70's. The latest version of MATLAB released by MathWorks is R2021b / September 22, 2021.MATLAB provides a quicker access to the image processing source-codes in its toolbox. Image Acquisition, Image enhancement, Image restoration, Image compression, Image segmentation [5-9] etc. can be easily done by MATLAB. Now a days all image processing techniques can be done in simulation. Some of simulation out has shown in Figure 2.
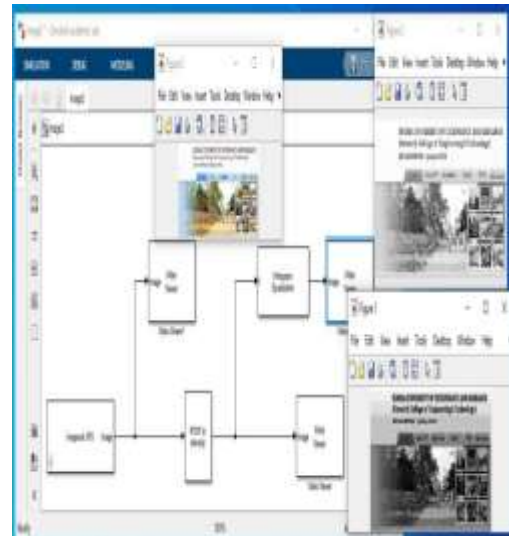

Figure3. Image pre-processing in MATLAB(simulink)

III. SCILAB:Scilab is a free prototyping climate for mathematical estimations like MATLAB. The Scilab Image Processing (SIP) Toolbox stretches out Scilab with many capacities to peruse and compose pictures in more than 100 significant record designs, including PNG, JPEG, BMP, and TIFF.Image sifting, edge identification, obscuring, division, shape examination, and picture acknowledgment should be possible with SIP[10].Scilab is a free programming made at INRIA–France for prototyping and mathematical handling. The current transformation of SCILAB will be Scilab 5.4,Which have been generally utilized in Unix-like frameworks. It has been embraced in numerous Universities and organizations all over the planet. Scilab is simple connecting to Fortran and C. Almost certainly Scilab is utilized for tackling low-level logical calculations yet many picture handling procedures should be possible in Scilab[11].Some out-put has shown in the Figure 3.

Figure4. Image pre-processing in SCILAB

IV. PYTHON:Python is a broadly utilized, deciphered, object-arranged, and undeniable level programming language with dynamic semantics, utilized for universally useful programming. It was made by Guido van Rossum, and first delivered on February 20, 1991. Python is a better choice for:Web and Internet development, Scientific and numeric computing , Ipython , Education, Desktop GUIs etc.

Matplotlib is used for 2D visualization, Scipy is used for mathematics and scientific computation. OpenCV and scikit focus on image processing. OpenEDG Python Institute gives an autonomous worldwide system to Python programming high-stakes assessments. The journey of python role is very wide in image processing. Binarization, segmentation, filtering can be done by different tools of python. Some out-put has shown in the Figure 4.
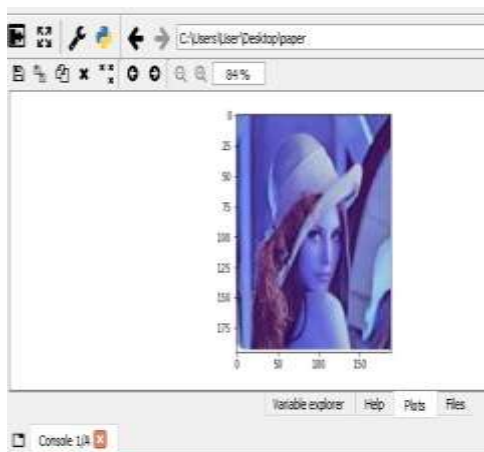

Figure5. Image pre-processing in Python (spyder)

V. Experimental Results in LAB VIEW:
This paper shows the clear vision of image processing in different software. Some of the output have shown in the Figure5.
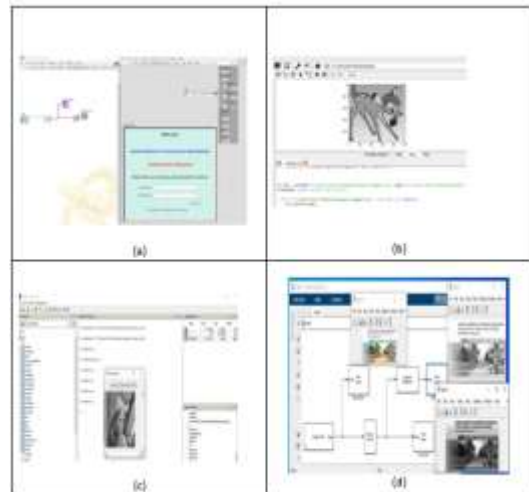

Figure 6. Output of image processing (a) LabVIEW (b)Python (c)SCILAB(d) MATLAB(SIMULINK)

CONCLUSION:
There are huge number of licensed version of software available for working in the field of image processing. All these highly paid software are not open for all to access. Here this paper shows the pre-processing of images using licensed software like MATLAB and LabVIEW as well as open software like SCILAB and Python. It can be observed there is no basic difference on both the platform. So in this COVID-19 Pandemic, one can easily use the open software for the desired research purpose.

REFERENCES
[1] Bindhu, A., and K. K. Thanammal. "Analytical Study on Digital Image Processing Applications."
[2] Tanimoto, Steven L. "Exploring mathematics with image processing." IFIP World Conference on Computers in Education. Springer, Boston, MA, 1995.
[3] Johnson, Gary W. LabVIEW graphical programming. Tata McGraw-Hill Education, 1997.
[4] Solomon, Chris, and Toby Breckon. Fundamentals of Digital Image Processing: A practical approach with examples in Matlab. John Wiley & Sons, 2011.
[5] Vera-Tizatl, Pamela, et al. "Tracking control of tomographic image acquisition robotic system based on active disturbance rejection theory with adaptive gains." Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control Engineering 234.1 (2020): 81-95.

[6]   Rasheed, Yawar, et al. "A Novel Model Driven Framework for Image Enhancement and Object Recognition." International Conference on Information and Software Technologies. Springer, Cham, 2020.

[7]   Nagy, James G., Katrina Palmer, and Lisa Perrone. "Iterative methods for image deblurring: a Matlab object-oriented approach." Numerical Algorithms 36.1 (2004): 73-93.

[8]   Gandhi, Meet, Juhi Kamdar, and Manan Shah. "Preprocessing of non-symmetrical images for edge detection." Augmented Human Research 5.1 (2020): 1-10.

[9]   Gandhi, Meet, Juhi Kamdar, and Manan Shah. "Preprocessing of non-symmetrical images for edge detection." Augmented Human Research 5.1 (2020): 1-10.

[10]   Solomon, Chris, and Toby Breckon. Fundamentals of Digital Image Processing: A practical approach with examples in Matlab. John Wiley & Sons, 2011.

[11]   Bharodiya, Anil K., and Atul M. Gonsai. "An intelligent assistive algorithm for bone tumor detection from human X-ray images based on binary Blob analysis." International Journal of Information Technology (2020): 1-7.