

# A Review Paper on Various Digital Image Processing Techniques and Their Implementation Tool

Anuradha Sharma<sup>1</sup>, Namita Hindwani<sup>2</sup>, Kuldeep Desai<sup>3</sup>, Krishna Kumar Joshi<sup>4</sup>, Sandeep Gupta<sup>5</sup>

<sup>1,2,3,4,5</sup>CSE department

<sup>1,2,3,4,5</sup>MPCT , Gwalior M.P., India

**Abstract-** Digital Image Processing phenomenon is Cast-off to perform various operations on automated images. Many algorithms exist for processing digital images. It's a sub category of digital signal process and has number of benefits above classical image processing technique. It is cast-off by the researchers for several research projects but the tools available are quite hard to use ,if researchers wants to do any research they have to create multiple rule of code to perform the task with the existing tools .So we desire to blot out the effort and make the research quite convenient by dint of our tool .

In our tool we will provide GUI to researcher to perform various tasks related to processing an Image .We will scale down the quantity of code and duration needed to pull off the research .There will be lot o f algorithms which will be there to analyze different kind of images and give various category of result with user friendly environment.

**Keywords-** Image processing, image enhancement, segmentation, etc.

## I. INTRODUCTION

In imaging scientific world, Image Processing is a method of dealing images by applying mathematical operations by using any format of signal processing. For this the image acts as input, a queue of images, or a video, like a video frame or a photograph.

After applying image processing methodology to the image input, the outcome may be either a bunch of innate or peculiarity correlated to the image or an image.



Figure 1. An example of processing done on Image.

Many of Image Handling techniques require handling the image as a 2-D signal and appealing standard signal-processing techniques to it. Also the Images are processed as 3-D signals where the third axis is a time or z-axis. Fig. 1 An instance of Image processing.

The input of an Image is taken in the pattern of matrix. When  $(x,y)$  and the intensity values of Function such that  $f()$  are all precise, distinct quantities ,the Image is known as digital image[1].

## II. MODULES

### A. IMAGE ENHANCEMENT

Operations related to Image enhancement may be applied in spatial range and/or frequency domain. In spatial realm image enhancement operations means remodel the pixels of image directly with help of MATLAB. This strategy has been further increased successfully to color images[2].

By ameliorating the contrast and suppressing the noise, Image Enhancement provides better visual quality.

### B. IMAGE SEGMENTATION

The Image Segmentation is necessitating with the distribution or separation of an Image into areas of identical features. Application of image segmentation process is to fetch the necessary properties of the image data, from which a illustrative, interpretative or intelligible lookout can be procured by the machine [3].

### C. NOISE REDUCTION AND SMOOTHING

Generally, Digital Images are affected by noise hence Noise Reduction process is used for eliminating unpleasant sound from the images. Noise Reduction is a method that deals with eliminating blare from a signal [4]. Noise Reduction methods are conceptually very similar nevertheless of the signal being processed, however a supposed

apprehension of the feature of an expected signal can mean the execution of these methods vary lean on the type of signal.

Key technology of image enhancement is image smoothing, which can remove noise in images. So, it is an essential function module in image-processing software. Removal of various noises and preserving details can be done by Excellent smoothing algorithm. [5]

#### D. IMAGE CLUSTERING

Clustering deals with arranging the objects that has similar properties in the similar cluster. The group of entities those same in nature based on properties and distinct to the other groups of the objects[6].

The ultimate regular used technique of data mining is Clustering .It is used for data analysis, image processing, pattern recognition and so on. Clustering is built on the concept of metadata. Partitioning of clustering included in clustering process. There is accumulation of clusters that divides the given data into same groups. Every element is maintained by hierarchy of cluster in Hierarchical Clustering. A Favorable number of methods based on clustering are present at times for the Image Segmentation process, to materialize this in bounteous proficient and potent aspect.

#### E. IMAGE COLOR CORRECTION

All manner of Processing an Image, functions are provided for correcting color for JAVA, .NET, C/C++, iOS , and Web developers. To correct images these functions are used with interchanged color channels, low proportional RGB/HSV pixel intensities are adjusted.

#### F. GEOMETRIC TRANSFORMATION

This technique provides geometric-transformation functions for many web developers.

Researchers may use these functions to execute various operation such as aligning images, correcting the images, and applying creative 3D effects to images.

#### G. WATERMARKING

Watermarking is a technique that closely linked to stegenography. In watermarking the invisible information is normally linked to hide object. Copyright preservation and possessor authentication is done by using this technique. In

this process confidential information is hidden by dint of carrier signal.

Watermarking depends on the original image hence it ought to be certifying that the watermark is indiscernible [7].

### III. MATLAB

MATLAB is a multi-exemplar differential computing environment. It refers to as matrix laboratory. It is a 4-G programming language. It is programming language developed by MathWorks.

This programming language permits manipulation in matrix, functions plotting, enactment of algorithms, developing of user interfaces. Integrating among programs penned in other languages, including C, C++, C#, Java, Fortran and Python. In MATLAB model-based architecture for dynamic and embedded systems and graphical multi-range simulation functions are provided by Simulink.

#### 1. What is GUI?

The appearance of software on the screen is defined as GUI. It is all about what the user see on the screen while interacting with it. To be more precise GUI is all about how a user can communicate with the hardware in more efficient and user friendly way. In GUI user uses a mouse and pointer to move on screen object, click on icons and other objects. GUI include scroll bar, buttons, menu, items etc. The applications based on GUI are user friendly because a user related to non-technical background can use that application.

The softwares based on GUI are user friendly because a user related to non-technical background can use that application.

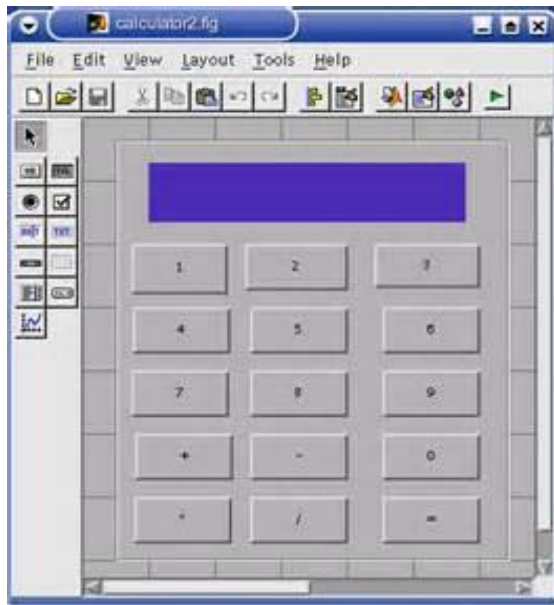


Figure 2. GUI of calculator

The Avizo outlook is modeled on the visual programming. Data can be intermutually connected together, and handled with several parameters generating a Visual Processing Network whose result is showed in a 3D viewer. Complex data can be collectively checked by applying a controlled sequence of computation and display processes resulting in a meaningful visual representation and associated derived data in its interface. By using Avizo one can work on following areas of image processing.

Image filtering Diluting Transform, Distance Transform, Image segmentation.

#### CVIPTOOLS:

CVIptools is referring to as Computer Vision and Image Processing Tools. It is image processing software which is used by windows user. Its previous versions are on deck for UNIX. It is an intermodal program for image processing.

It is refined by CVIP Laboratory at Southern Illinois University at Edwardsville Features It can read many formats of an Image such as PNG,GIF,TIFF,BMP, JPEG in addition raw formats. Standard Image processing services are patronized by this software. CVIptools5.x includes two powerful refined widget that allows automated algorithm analysis and development and also for batch processing.

It include image constriction, image restoration, logical and arithmetical operations between images, contrast manipulation, image sharpening. Its functional area is computer vision for example, image compression layout for human vision applications. The feature extraction as well pattern classification is an fundamental part of all computer perceiving systems.

The main operational function of this tool is to explore pattern classification and feature extraction .Batch processing method is also allowed with bigger sets of image for user in this tool. Selecting the features and classification parameters are given to the user for the automatic execution of these large image sets.

Its main motto is to find the supreme criterion for a specific relevance during best classifies the image objects of interest.

#### ITK SNAP:

This is a type of interdependent tool that allows consumer to navigate 3-D images in medical sciences, manually represents anatomical areas of interest, and perform automatic image segmentation. The feature of the program is

## H. HARDWARE REQUIREMENTS AND SOFTWARE REQUIREMENTS

Following environments were used for the development of this project.

Tool: MATLAB

VERSION: R2013a

Operating System: Windows 10

Hardware Required To Develop This System:

Processor core 2 dual or greater processor

RAM 2 GB

HDD 250 GB

FDD 1.44 MB

CD-ROM 32X

15 inches Color Monitor 104 Keys Keyboards

Printer DeskJet 670

## IV. SOFTWARE REQUIREMENT SPECIFICATION

### 1. EXISTING TOOLS FOR IMAGE PROCESSING

#### AVIZO:

A purposive commercial application for scientific, industrial data analysis. It was designed by FEI Visualization Science Group and was primarily accomplish and established by the Visualization and Data Analysis Group at Zuse Institute Berlin (ZIB) named as Amira. Avizo is a software that permits users to perform interactive perception and calculation on three dimensional Data file.

Image navigation. Manual segmentation device for non automatic delineation in images are provided by ITK-SNAP.

Labeling can take place in all orthogonal cut planes and output can be visualized as a 3-D apprehension

#### **OPENCV:**

Open Source Computer Vision is a batch of programming functions. It is mainly focused at real-time computer perception organized by Intel's research center in Nizhny Novgorod (Russia).

It is frequently used to work with magnetic resonance imaging and computed tomography data files. Several optimization methods are available in it. In this there are major manipulations to the interface of C++ so that there will be more type of safe pattern, new functions and better developing dimensions in terms of performance. Its area of application involves - Ego motion estimation Gesture recognition.

#### **MIMICS:**

It is an image processing feature used for 3D design. It is designed by Materialise NV Materialise It is cast-off to make 3D base dummy from stacks of 2D image data. It is a composition for Materialise Interactive Medical Image Control System.. The current version is 19.0 of this software supports Windows 7, Vista and XP.

It evaluates surface 3D models from stacked Image Data for example - Confocal Microscopy; X-ray by dint of image segmentation. Input format which is very common in this is DICOM. Other formats of image like: JPEG, TIFF, BMP are also promoted by this software. On subsequent application the format of output file differs This software is cast-off by biomedical engineers and device manufacturers for R&D purposes in various medical industries; Orthopedic, Pulmonology, Cardiovascular, Craniomaxillofacial This software is cast-off by non medical industries for processing images in research and development. Application 1. Computer Aided Design: 3-matic, Solid Works, Pro/E...etc. 2. Computational Fluid Dynamics: FLUENT, CFX etc. 3.

Rapid Prototyping: EOS, Stratasys , 3D Systems, ZCorp.

#### **VISUALAP:**

To build emulate systems and applications this software is used names as VisualAp. It is an viewable framework .It provides a viewable framework lightweight

visual components(proclets) that execute specific task. The abilities of VisualAp prolonged by user written proclets. VisualAP allow audio, text, other process-driven emulation .Using eclipse , custom analysis can be developed. It is cross platform and is 100% java application. Internally the VisualAp programming language revolves around XML.

By selecting components from toolbox, configuring the parameters with help of JavaBeans framework user can design any system or application. Also user can link the components in sync to set up communication channels among these components. Multiple threads are executed in VisualAp when so ever multiple components are ready for execution simultaneously.

The user can do following operations from the application menu: create, load and save a system, run process simulation of the coeval system, check the correctness of the coeval system. The user is able do following operations inside the main window: edit parameters defining the behavior of the component, Instantiate a component, move a component, connect/disconnect another component. It includes visual component in version 1.1 display input data. write data (text, audio stream, image) to a file.

Dataflow programming language is cast-off to illustrate a system in VisualAp. Structure of Graphical block diagram shows the Execution of VisualAp, on which programmer connects different parts by drawing connectors.

#### **WEKA:**

The term WEKA refer to as Waikato Environment for Knowledge Analysis. It is most famous tool for machine learning software.

It was designed at the University of Waikato, New Zealand. WEKA has a lot of algorithms and visualization tools for predictive modeling and data analysis, along with graphical user interface for easily access to these functions. Java language is cast-off to design WEKA. Features from an image can be extracted to perform operations on image using this tool.

The segment is made for segmentation by interactive learning.

#### **MEVISLAB:**

MeVisLab is a Tool for scientific visualization and medical image processing. It contains advanced algorithms for segmentation, quantitative morphological, image restoration

and analysis of functional image. It is cross-platform application framework. In MeVisLab, a rapid user interface prototyping and for graphical programming an IDE is available.

It is available as cross-platform on Windows, Linux, and Mac OS X. It is penned in C++ and uses framework for graphical user interfaces. It contains following features: 2D image viewing: Fast, modular, extensible 2D viewers with combined 2D/3D rendering are implemented, supporting slab rendering.

#### APHELION:

This software is use to execute image processing functions and analysis. 2D and 3D, monochrome, color, and multi-band images are supported by Aphelion.

It was established by ADCIS, situated in Saint-Contest, Calvados and Normandy. This tool is widely used in scientific industry to resolve basic and complex imaging applications. Processing pixels of digital images automatically is the main principle of image processing, then elicitate more than one objects of interest and evaluate one or more measurements on those objects to calibrate the image and generate a verdict.

We can say that starting from an image, pixels are processed by a group of successive functions or operators until only measurements are calculated and used as the input of a third system or classification software that will classify desired objects that has been pulled during the imaging process. Entire functions for image processing in this software are penned in C++, and user interface is penned in C#.

The imaging application is quickly established from the Graphical User Interface.

#### MATLAB:

MATLAB referred as matrix laboratory is a multi-exemplar differential computing environment. It is a fourth-generation programming language. It is programming language designed by MathWorks .It is mostly used tool for image processing.

Presently it is cast-off in teaching algebra, numerical analysis, and is famous among almost all scientists ramified in image processing or we can say it is cast-off in field of education. This programming language allows data, creation of user interfaces. Integrating other languages,

accomplishment of algorithms, matrix manipulations, including C, C++, C#. Java, Fortran, Java and Python.

Researchers can perform operations like Noise reduction, image enhancement, image segmentation, image analysis, geometric transformations, and image restoration.

### V. ABOUT YOUR TOOL

MATLAB is a collaboration platform where we are trying to make such a tool which will be beneficial for researchers. All modules of processing an image will get compact at one place in graphical user interface.

One can easily perform different operations on image using single tool like deblurring, segmentation, clustering etc. This type of tool is not introduced yet with a single module. Result will be shown on single press rather than coding like on other tools. It will be a remarkable tool for the academic and researching world, this fantasy realm where good ideas and future inventions and technologies cast-off in the world.

Embedded coding tool will be the most beneficial as it will reduce time of coding for every module. Features like

#### 1. IMAGE ENHANCEMENT –



Figure 3.

It increases the signal- to - noise ratio and modify image features by using the colors of a image. It Correct errors like red-eye and imbalanced colors ,Improve diagnostic valuation of medical images ,apply image enhancement method to many color bit depths of images which are common photographic errors .

#### IMAGE SEGMENTATION-

Image segmentation is a prime step in OCR preprocessing as it helps improve recognition results and speed.

Image Segmentation for Medical Imaging .Standard compression schemes works well when an image is entirely

comprised of either text or color elements. Medical image segmentation helps health-care professionals to review the image well.

**NOISE REDUCTION AND SMOOTHING-**

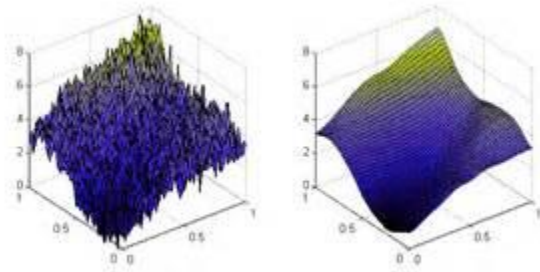


Figure 4.

Noise reduction is a technique which smooth's and reduces noise in images. This feature may be cast-off to improve image quality, perceiving results, and compression ratios through the removal of image noise. Making snaps clearer and more illustrative appealing, images modernized by noise reduction have many benefits in both document and medical imaging fields.

To enhance the quality of an image noise is being reduced. All the noise reduction methods are equivalent in a conceptual manner, no matter what image is being processed, however the approach of these methods may vary as per the needs.[8]

**IMAGE CLUSTERING-**

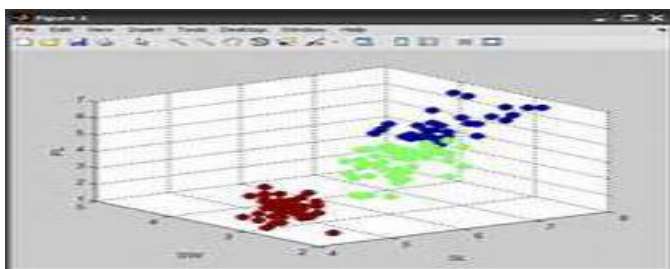


Figure 5.

The Method of putting objects into order and grouping those members which are monotonous in some or the different way .Clustering process deals with arranging the objects that has similar properties in the similar cluster.

The bunch of objects those are same in nature based on properties and distinct to the other groups of the objects.

**IMAGE COLOUR CORRECTION-**



Figure 6.

To make image effective in colors image color correction strategy is used. It provides a purview of Image processing functions of color correction for Web developers.

To rectify images with interchanged color channels these functions can be cast-off. It adjusts peaky balanced RGB/HSV pixel intensities, or apply artistic effects like sepia and grayscale filters.

The color correction technique is based on the peculiarity of color constancy observed in human visual discernment. It is applied in face detection system, which draws the analogy of the parallel organization of visual neural pathways, parvocellular and the magno channels. [9]

**GEOMETRIC TRANSFORMATIONS-**

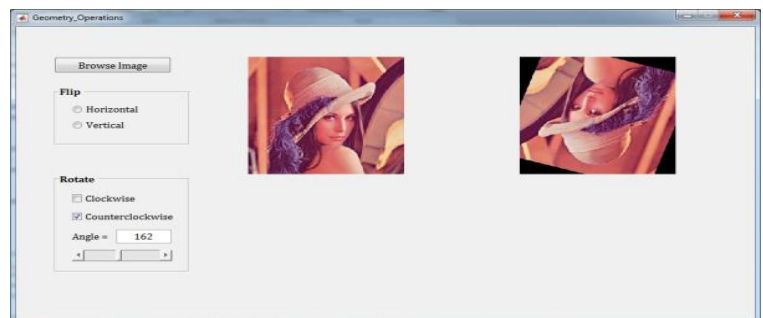


Figure 7.

Geometric transformation provides features like image rotation, resize, reshape in different angles and in different forms.

These features can be cast-off to align, correct images, and applying creative 3D effects to images.

Coordinate system is used for affine transformation .The affine transformation serves as the basic block in the analysis and registration of general geometric transformations. [10]

**WATERMARKING:**

Figure 8.

Watermarking is the phenomenon of thrashing automated information in a conveyor signal. Its not compulsory that hidden information should have any relation to the conveyor signal.

Digital watermarks are also used to corroborate the authenticity or integrity of the conveyor signal or to show the identity of its possessor. It is flamboyantly used for tracing copyright infringements and for banknote authentication

**ADVANTAGES OF OUR TOOL –**

- Time shaving.
- Highly Efficient.
- No need to import image again and again.
- Core philosophy in designing the product will be simply combining modules with the help of GUI.

**VI. CONCLUSION**

As we saw the features of processing an image have been done on tools which are not user friendly. We will make such a tool in which coding will be already done. It is GUI based project in which one can do operations on image without coding .Further modules can be added to the tool as per researchers need. This project revolves around RAD (Rapid Application Development) Model.

It can further enhanced as per researcher needs.

**REFERENCES**

- [1] Kamal K Vyas, Dr S Tiwari, Amita Pareek, “DIGITAL IMAGE PROCESSING : A focused Medical Application” International Journal of Scientific & Engineering Research Volume 3, Issue 10, pp no. 1-7, October-2012.
- [2] Suneetha\* and Dr.T.Venkateswarlu, “Image Enhancement through Noise Suppression using Nonlinear Parameterized Adaptive Recursive Model” International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue4, July-August 2012, pp.1129-1135
- [3] Kimmi Verma, Aru Mehrotra, Vijayeta Pandeyandand and Shardendu Singh, “Image Processing Techiques For The Enhancement of Brin TUMOR PATTERNS” International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol. 2, Issue 4,pp no. 1611-1615, April 2013.
- [4] Mrs. C. Mythili and Dr.V.Kavitha,” Efficient Technique for Color Image Noise Reduction” The Research Bulletin of Jordan ACM, Vol. II (III),pp no. 41-44
- [5] Qin Zhiyuan , Zhang Weiqiang , Zhang Zhanmu , Wu Bing , Rui Jie ,Zhu Baoshan “A ROBUST ADAPTIVE IMAGE SMOOTHING ALGORITHM”, a Institute of Surveying and Mapping, Zhengzhou , China,qzywlf@public.zz.ha.cn b Southwest Institute of Electronic & Telecommunication Technology, Chengdu, China hnlhlywb@163.com Commission VII, WG VII/6 pp no.1-6
- [6] Mohit Agarwal and Gaurav Dubey,” Application of clustering technique for Image Segmentation” International Journal of Advanced Research in Computer Science and Software Engineering Volume 3, Issue 4, pp no.764-766, April 2013
- [7] Ajinkya Kawale, Shubham Gaidhani,” Digital Image Watermarking” International Journal of Scientific & Engineering Research, Volume 4, Issue 5,pp no.1899-1901, May-2013
- [8] Harsh Prateek Singh, Ayush Nigam, Ankit Kumar Gautam, Aakanksha Bhardwaj, Neha Singh,” Noise Reduction in Images using Enhanced Average Filter”, International Conference on Advances in Computer Engineering & Applications (ICACEA-2014) at IMSEC,GZB,pp no.25-28
- [9] Krzysztof M. Kryszczuk and Andrzej Drygajło,” Color Correction for Face Detection Based on Human Visual Perception Metaphor”, Signal Processing Institute, Swiss Federal Institute of Technology, Lausanne (EPFL) [krzysztof.kryszczuk, andrzej.drygajlo]@epfl.ch
- [10] N. V. Narendra Babu, Prof. Dr. G. Manoj Someswar,

Ch. Dhanunjaya Rao,” Research Analysis and Design of Geometric Transformations using Affine Geometry”,International Journal of Engineering Inventionse-ISSN: 2278-7461, p-ISSN: 2319-6491 Volume 3, Issue 3 (October 2013) PP: 25-30