Computer Vision through Image Processing System

[1]Satonkar S.S., [2]Kurhe A.B. and [3]Khanale P.B.

[1]Department of Computer Science, Arts, Commerce and Science College, Gangakhed, (M.S.), India
[2]Shri Guru Buddhiswami College, Purna, (M.S)
[3]Dnyanopasak College, Parbhani, (M.S.)
e-mail: snehalrpatil_6@yahoo.com, sukeshanee@yahoo.com

Abstract—Recently Image processing is attracting much attention in the society of network multimedia information access. Area such as network security, content indexing and retrieval, and video compression benefits from image processing system. The present paper shows the steps in image processing system. In the image processing system different elements are overviewed. The image processing classification is also highlighted in the paper.

Keywords: Computer Vision, Image Processing, Intensity Image, Visual data

I. INTRODUCTION

Digital images play an important role, both in daily-life applications such as satellite television, magnetic resonance imaging, computer tomography as well as in areas of research and technology such as geographical information systems and astronomy. An image is a 2D representation of a three-dimensional scene. A Digital image is basically a numerical representation of an object. The term digital image processing refers to the manipulation of an image by means of a processor. The different elements of an image-processing system include image acquisition, image storage, image processing and display.

II. WHAT IS AN IMAGE?

- Picture, Photograph
- Visual data
- Usually two-or three dimensional

III. WHAT IS A DIGITAL IMAGE?

- An image which is "discretized," i.e., defined on a discrete gird e.g. scanner
- Two-dimensional collection of light intensity values (or gray values)
- Matrix, two-dimensional function

IV. WHAT IS DIGITAL IMAGE PROCESSING?

Digital image processing deals with the manipulation and analysis of pictures by a computer.
- Improve pictorial information for better clarity (human interpretation).
- Automatic machine processing of scene data (interpretation by a machine/non-human, storage, transmission).

V. DIGITAL IMAGE REPRESENTATION

An image may be defined as a two-dimensional function, $f(x, y)$, where x and y are spatial (plane) coordinates, and the amplitude of f at any pair of coordinates (x , y) is called the intensity of the image at that point. The term gray level is used often to refer to the intensity of monochrome images. Color images are formed by a combination of individual 2-D images. *e.g.* RGB color system, a color image consists of three (red, green and blue) individual component images.

VI. DIGITAL IMAGES CLASSIFICATIONS

Digital images can be broadly classified into two types and they are
- Bitmap image or Raster Image
- Vector image

A. Bitmap Image or Raster Image

A raster image file is generally defined as a rectangular array of regularly sampled values known as pixels. Scanned graphics and web graphics are the most common forms of raster images. Raster images are mapped to grids which are not easily scalable. A raster image is resolution dependent because it contains a fixed number of pixels that are used to create the image. Since there are a fixed and limited number of pixels, a raster image will lose its quality if it is enlarged beyond that number of pixels as the computer will have to 'make up' for the missing information.
Raster image formats include BMP(Windows Bitmaps), JPEG (Joint Photographic Expert Groups), GIF (Graphics Interchange Format), PNG (Portable Network Graphics), PSD (Adobe Photoshop) and CPT (Corel Photo Paint) etc.

B. Vector Image

A Vector image is defined by objects which are made of lines and curves that are mathematically defined in the computer. A vector can have various attributes such as line thickness, length and color. Vector images are mathematically defined and hence, they are easily scalable. This implies that vectors can be printed at any size, on any output device, at any resolution, without losing the detail and without altering the resolution of the image.

VII. IMAGE TYPES

Image can be broadly classified under four categories
- Black and white or Binary image
- Gray Scale image or Intensity image
- Color Image or Indexed image
- RGB Image
- Multiframe image

1. Binary image

This image format also stores an image as a matrix but can color a pixel black or white (and nothing in between). It assigns a 0 for black and 1 for white.

2. Intensity image

This is equivalent to a "gray scale image". It represent an image as a matrix where every element has a value corresponding to how bright/dark the pixel at the corresponding position should be colored. An 8-bit image will have a brightness variation from 0 to 255 where '0' represents black and 255 represents white. A grayscale image measures only the light intensity. Each pixel is a scalar proportional to the brightness.

3. Indexed image

It representing color images. Index image store an image as two dimension matrix. The first matrix has the same size as the image and one number for each pixel. The second matrix is called the color map and its size may be different from the image. The numbers in the first matrix is an instruction of what number to use in the color map matrix.

4. RGB image

It represents an image with three matrices of sizes matching the image format. Each matrix corresponds to one of the colors red, green, or blue and gives an instruction of how much of each of these colors a certain pixel should use.

5. Multiframe image

In some application we want to study a sequence of images. This is very common in biological and medical imaging where you might study a sequence of slices of a cell. The Multiframe format is a convenient way of working with a sequence of images.
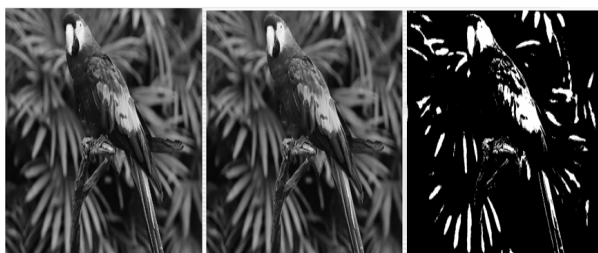
RGB   Gray Scale   Black & White

VIII. IMAGE FILE FORMATS

A file format is a method used to store digital data and different file format exist for storing images. The Bit Depth means require storage space of each pixel in an image.

1. TIFF/TIF

TIFF stands for Tagged Image File Format. TIFF files are often used with scanned images and to exchange files between applications and computer platforms. The goals of the TIFF specification include extensibility, portability, reversibility. The Bit Depth is 24-Bit. The recognized extension is.tif,.tiff. It Open/Extract with most graphics applications and image viewers - Photoshop, Illustrator etc. The advantage of TIFF file format is that it can support any range of image resolution, size and color depth and different compression technique.

2. PNG

PNG stands for Portable Network Graphics, it use with the Internet and World Wide and Web. The PNG file format support true color (16 million colors). The important feature are it use a lossless compression scheme, interlaced and it support 8-Bit transparency. The recognized extension is.png. It Open/Extract with some image viewers Not all – not widely used.

3. GIF

GIF stands for Graphics Interchange Format. GIF file format only allows 256 colors. It was originally designed to minimize file transfer times over phone lines. It use lossless compression scheme, create simple animations and GIF interlaced images can be displayed as low resolution images initially and then develop clarity and detail gradually. The Bit Depth is 8-Bit. It Open/Extract with Internet Web Browser, most image viewers - Photoshop, Illustrator etc.
The advantage of GIF file format it support transparency and interlacing.

4. JPEG/JPG

JPEG stands for Joint Photography Experts Group. JPEG is not actually a file type. JPEG is the most important current standard for image compression. This format provides the most dramatic compression option for photographic images. This format is useful when the storage space is at a premium. The important feature of JPEG file format are it use a lossy compression scheme, images are not interlaced; however, progressive JPEG images can be interlaced. The Bit Depth is 24-Bit. The recognized extension is.JPEG/JPG. It Open/Extract with any Web Browser most graphics application and image viewers – Photoshop, Illustrator, etc.

5. *JPEG2000*

Recently new version of the JPEG is JPEG2000. It provides much better image quality at smaller file sizes than JPEG does. Based on wavelet compression, JPEG2000 offers both lossless and lossy compression. It creates scalable image files, which means that no decompression is needed for reformatting. New features include region of interest coding, improved error resilience, resolution scalability, random access or spatial scalability, and quality scalability.

6. *BMP*

BMP stands for Windows Bitmap. The Bit Depth is 24-Bit. The recognized extension is.bmp. It Open/Extract with most graphics application and image viewers – Photoshop, Illustrator, etc.

IX. ELEMENTS OF AN IMAGE PROCESSING SYSTEMS

- Image Sensors & Acquisition elements which involves image sensors like CCD sensors, CMOS sensors, & Image Scanners
- Image Storage devices
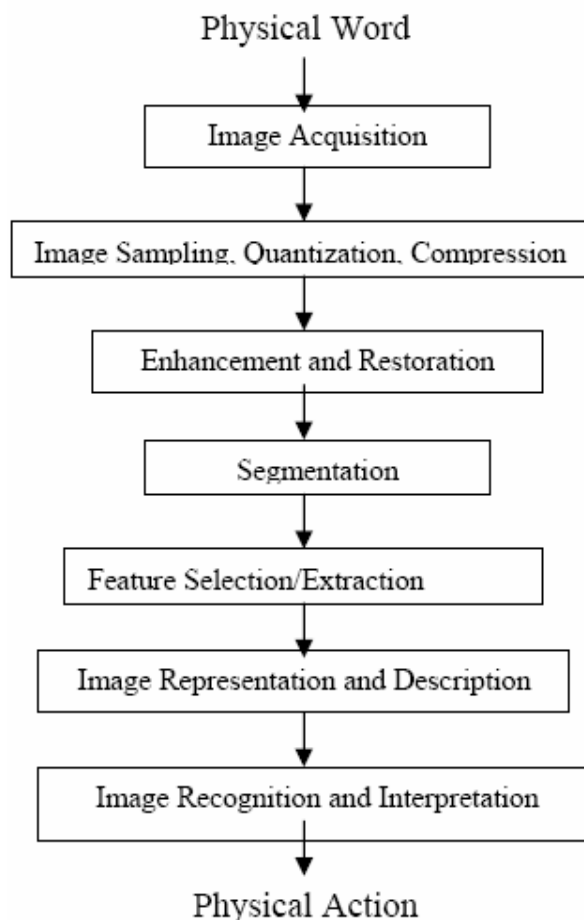- Image display devices

X. IMAGE ANALYSIS SOFTWARE

APPLICATIONS & LIBRARIES

Product	Developer
Fiji	Max-Planck-Institute
of Molecular Biology	
and Genetics	
BioImage Suite	
	Yale University
CellProfiler	Broad Institute
JMicro Vision	Nicolas Roduit
NIH Image	Research Services
Branch(NIMH)	
Mathematica	Wolfram Research
Matlab Image Processing Toolbox	Mathworks
NGI	http://ngi.central.org

XI. IMPORTANT STEPS IN A TYPICAL IMAGE PROCESSING SYSTEM

- Capturing visual data by an imaging sensor.
- Convert data into discrete form , Compress for efficient storage/transmission.
- Improving image quality (low contrast, blur, noise).
- Partition image into objects or constituent parts.
- Extracting pertinent features(or descriptors) from an image that are important for differentiating one class of objects from another.
- Assigning labels to an object based on information provided by descriptors.

- Assigning meaning to an ensemble of recognized objects.

Physical Word → Image Acquisition → Image Sampling, Quantization, Compression → Enhancement and Restoration → Segmentation → Feature Selection/Extraction → Image Representation and Description → Image Recognition and Interpretation → Physical Action

XII. APPLICATION OF DIGITAL IMAGE PROCESSING

- Medicine
- Remote sensing
- Communications
- Automotives
- Medicine
- Neural Network

XIII. ADVANTAGES OF DIGITAL IMAGES

- The processing of images is faster and cost-effective.
- Digital images can be effectively stored and efficiently transmitted from one place to another.
- When shooting a digital image, one can immediately see if the image is good or not.
- Copying a digital image is easy. The quality of the digital image will not be degraded even if it is copied for several times.

- Whenever the image is in digital format, the reproduction of the image is both faster and cheaper.
- Digital technology offers plenty of scope for versatile image manipulation.

XIV. CONCLUSION AND SCOPE FOR FUTURE RESEARCH

Hence after studied all these work we conclude to understanding the Biometric technology it is necessary to study image processing system.

In this paper we have given concepts of Images, Image processing systems.

The present paper can provide the readers a better understanding about Image processing system and the topic is open to further research.

REFERENCE

[1] Onsen TOYGAR, Adnan ACAn , " Face Recognition using PCA, LDA and ICA approaches on colored images".

[2] Kailash J.Karande, Sanjay N.Talbar, "Face recognition under Variation of Pose and Illumination using IndependentComponent Analysis".

[3] Shang-Hung Lin, "An Introduction to Face Recogntion Technology".

[4] Fromherz T., Stucki P., Bichsel M., "A survey of Face Recognition".

[5] Calvo R.,Partridge M., and Jabri M., "A Comparative Study of Principal Components Analysis Techniques".

[6] Yambor W.S.,"Analysis of PCA- Based and Fisher Discriminant- Based Image Recognition Algorithms".

[7] Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins,"Digital Image Processing Using MATLAB"

[8] S.Jayaraman et. al. ," Digital Image Processing".

[9] Anil K.Jain , "Fundamental of Digital Image Processing".

[10] Digital Image-processing fundaments are given in this website: http://www.ph.tn.tudelft.nl/courses/FIP/frames/fip.html