

DIGITAL IMAGE PROCESSING

– Sequence, Components and Pros

K.Radhika, P.Vishalini

Lecturers in Computer Science.

Singareni Collieries Women's Degree College Kothagudem, Telangana

Abstract: Image processing is any form of signal processing for which the input is an image, such as a photograph or video frame, the output of image processing may be either an image or a set of characteristics or parameters related to an image.

An image may be considered to contain sub-images. So, in image processing system it should be possible to apply specific image processing operations to selected regions.

The computer in image processing system is a general purpose computer and can range from a PC to a super computer. Software for image processing consists of specialized modules that perform specific tasks.

Digital image processing techniques were developed in 1960's Bell laboratories. Digital image processing is the use of computer algorithms to perform image processing on digital images. Digital image processing allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing. Digital image processing offer both more sophisticated performance at simple tasks and the implementation of methods.

INTRODUCTION:

Image processing is any form of signal processing for which the input is an image, such as a photograph or video frame, the output of image processing may be either an image or a set of characteristics or parameters related to an image

- Image processing refers to digital image processing i.e., processing of a 2D picture by a computer.
- An image in "real world" is considered to be a function of two real variables, for example $a(x, y)$ with a as the amplitude of the image at a real co-ordinate position (x, y) .
- A digital image is an image $a(x, y)$ that has been discretized both in spatial co-ordinates and brightness.
- Digitization of spatial co-ordinates (x, y) is called **image sampling**.
- Amplitude digitization is called **gray level quantization**.
- Modern digital technology manipulates multi-dimensional signals with systems that range from simple digital circuits to advanced parallel computers.

The goal of this manipulation can be divided into three categories.

1. Image processing (image in-> image out)
2. Image Analysis (image in -> measurement out)
3. Image understanding (image in -> high level description out)

SEQUENCE OF IMAGE PROCESSING:

- The most requirements for image processing of images is that the images be available in digitized form i.e., array of finite length binary words. A typical approach of storing an image digitally on a computer is by sampling the image at a rectangular grid. The color or intensity at each of these points is converted into a numeric value and stored in the computer. Apart from the color/intensity at those specific points, everything else is discarded when the image is stored in the computer. Regardless of how we reconstruct the image, if we do not use enough digital samples, that is, not enough samples per image area, we are not able to reconstruct the original, continuous image. The spatial frequency content in the digital image. This is called aliasing.
- Before going to processing an image it is converted into a digital form. Digitization includes sampling of image and quantization of sampled values. After converting the image into bit information, processing is performed.

Fundamental steps of Image processing are –

1. **Image acquisition:** To acquire a digital image.
2. **Image processing:** To improve the image in ways that increase the chances for success of the other processes.
3. **Image segmentation:** To partitions an input image into its constituent parts or objects.
4. **Image representation:** To convert the input data to a form suitable for computer processing.
5. **Image description:** To extract features that result in some quantitative information of interest or features that are basic for differentiating one class of objects from another.
6. **Image recognition:** To assign a label to an object based on the information provided by its descriptors.
7. **Image interpretation:** To assign meaning to an ensemble of recognized objects.
8. Knowledge about a problem domain is coded into an image processing system in the form of a knowledge database.

Fundamental Steps in Digital image processing:

The processing technique may be

- 1.) **Image enhancement:** sharpening of image features such as boundaries or contrast to make a graphic display more useful for display and analysis.
- 2.) **Image restoration:** Filtering the observed image to minimize the effect of degradation effectiveness of

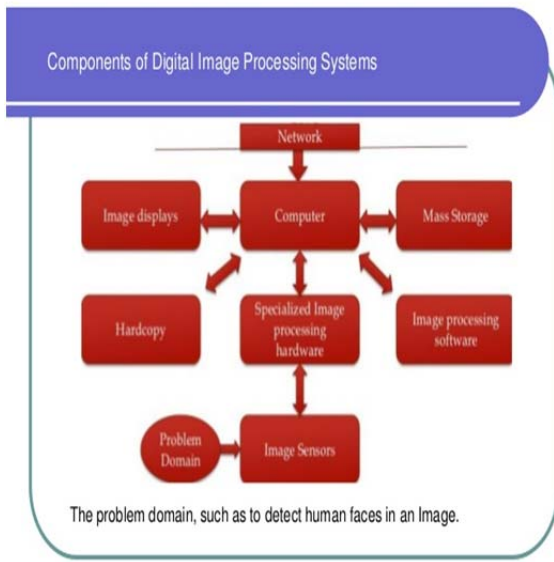
image restoration depends on the extent and accuracy of the knowledge of degradation process as well as on filter design.

- 3.) **Image compression:** Minimizing the no. of bits required to represent an image application of compression are in broadcast TV, remote sensing via satellite, weather maps, etc.

Digital image processing techniques were developed in 1960's Bell laboratories. Digital image processing is the use of computer algorithms to perform image processing on digital images. Digital image processing allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing.

Digital image processing offer both more sophisticated performance at simple tasks and the implementation of methods. Digital image processing is the use of computer algorithms to create process, communicate and display digital images.

COMPONENTS OF IMAGE PROCESSING SYSTEM



October 5, 2013

5

- **Computer:** In an image processing system is a general purpose computer and can range from a PC to a super computer. In dedicated applications, some times specially designed computers are used to achieve a required level of performance.
- **Software:** for image processing consists of specialized modules that perform specific tasks.
- **Mass storage:** capability is must in image processing applications. Digital storage for image processing applications falls into three principle categories: (1) short-term storage (2) on-line storage for relatively fast recall, (3) archival storage, characterized by infrequent access.
- **Image display:** It displays the images.
- **Hardcopy devices:** Used for recording images include laser printers, film cameras, heat sensitive devices, inkjet units and digital units such as optical and CD-ROM disks.

Numerous models of image processing systems being sold throughout the world were rather substantial peripheral devices that attached to equally substantial host computers.

Although large-scale image processing systems still are being used for massive imaging applications, such as processing of satellite images, the trend continues towards miniaturizing and blending of general purpose small computers with specialized image processing hardware.

With reference to sensing, two elements are required to acquire digital images. The first is a physical device that is sensitive to the energy radiated by the object we wish to image. The second, called digitizer is a device for converting the output of the physical sensing device into digital form. For instance in digital video camera, the sensors produce an electrical output proportional to light intensity.

The digitizer converts these outputs to digital data. Specialized image processing hardware usually consists of the digitizer just mentioned, plus hardware that performs other primitive operations, such as an Arithmetic Logic Unit (ALU) which performs arithmetic and logical operations in parallel on entire images. One example of how and ALU is used is in averaging images as quickly as they are digitalized, for the purpose of noise reduction. This type of hardware sometimes is called a front end sub system, and its most distinguish characteristics is speed. In other words, this unit performs functions that require fast data throughputs (e.g., digitizing and averaging video images at 30 frames) that the typical main computer cannot handle the computer in an image processing system is a general purpose computer and can range from a PC to a super computer.

In dedicated applications. Some times specially designed computers are used to achieve a requires level to performance, but our interest here is on general purpose image processing systems. In these systems almost any well equipped PC type machine is suitable for offline image processing tasks.

Software for image processing consists of specialized modules that performs specific tasks. A well-designed package also includes the capability for the user to write code that, as a minimum utilizes the specialized modules. More sophisticated software packages allow the integration of those modules and general purpose software commands from at least one computer language.

Mass storage capability is a must in image processing applications. An image of size 1024*1024 pixels, in which the intensity of each pixel is an 8-bit quantity, requires one megabyte of storage space if the image is not compressed. When dealing with thousands or even millions, of images providing adequate storage in an image processing system can be a challenge. Digital storage for image processing applications falls into three principal categories.

1. Short-term storage for use during processing.
2. Online storage for relatively fast recall.
3. Archival storage characterized by infrequent access.

Storage is measured in bytes (eight bits), Kbytes (one thousand bytes), Mbytes (one million bytes), Gbytes (meaning giga or one billion, bytes) and Tbytes (meaning tera, or one trillion, bytes).

One method of providing short term storage is computer memory. Another is by specialized boards called frame buffers, that store one or more images and can be accessed rapidly, usually at video rates (eg., are 30 complete images per second). The latter method allows virtually instantaneous image zoom, as well as scroll (vertical shifts) and pan (horizontal shifts).

Image displays in use today are mainly color (preferably flat screen) TV monitors, Monitors are driven by the outputs of image and graphics display cards that are an integral part of the computer system. Seldom are there requirements for image display applications that cannot be met by display cards available commercially as part of the computer system.

In some cases, it is necessary to have stereo displays, and these are implemented in the form a head gear containing two small displays embedded in goggles worn by the user.

Hardcopy devices for recording images include laser printers, film cameras, heat-sensitive devices, inkjet units and digital units, such as optical and CD-ROM disks. Film provides the highest possible resolution, but paper is the obvious medium to choice for written material.

For presentations images are displayed on film transparencies or in a digital medium it image projection equipment is used. The latter approach is gaining acceptance as the standard for image presentations. Networking is almost a default function in any computer system in use today. Because to the large amount of data inherent in image processing applications, the key consideration in image transmission is bandwidth. In

dedicated networks, this typically is not a problem, but communications with remote sites via the internet are not always as efficient. Fortunately, this situation is improving quickly as a result of optical fibre and other broad band technologies.

Advantages:

- DIP made images can be noise free.
- It can be made available in any desired format.
- Digital image is the ability of the operator to post process the image.
- It allows the electronic transmission of images in third-party providers.

CONCLUSION:

The digital image can be optimized for the application by enhancing or altering the appearance of structures within it. In electrical engineering and computer science, image processing is any form of signal processing for which the input of an images (such as photographs) , the output of image processing can be either an image or a set of characteristics or parameters related to the image. Most of the techniques involve treating the image as two – dimensional signal.

REFERENCES:

1. https://en.wikipedia.org/wiki/Digital_image_processing ee.org/xpl/RecentIssue.jsp?punumber=83
2. http://www.authorstream.com/Presentation/pl_arun-360868-image-processing-ip-arunpl-science-technology-ppt-powerpoint/
3. <http://www.slideshare.net/shimulsakhawat/introduction-to-digital-image-processing-43629244>
4. <http://www.slideshare.net/manpreetgrewal/digital-image-processing-10707507>
5. <http://www.slideshare.net/MysteriousAarohi/image-processing-an-introduction>