SEMINAR ON
“IMAGE PROCESSING”

Given By:-
Sudhir Phophaliya
B.Tech IV Year
Computer Science
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Image

- Image is replica of object.
- An image defined in the "real world" is considered to be a function of two real variables $x$ and $y$. 
Example

- A digital image $a[m,n]$ described in a 2D discrete space is derived from an analog image $a(x,y)$.

- The 2D continuous image $a(x,y)$ is divided into $N$ rows and $M$ columns.
Image Processing

- Image processing is a physical process used to convert an image signal into a physical image. The image signal can be either digital or analog.
- Image processing is any form of signal processing for which the input is an image, such as photographs or frames of video; the output of image processing can be either an image or a set of characteristics or parameters related to the image.
- Any image improvement, such as refining a picture in a paint program that has been scanned or entered from a video source.
Why Image Processing

• since the digital image is “invisible” it must be prepared for viewing on one or more output device (laser printer, monitor, etc)
• the digital image can be optimized for the application by enhancing or altering the appearance of structures within it (based on: body part, diagnostic task, viewing references, etc)
• it might be possible to analyze the image in the computer and provide cues to the radiologists to help detect important/suspicious structures (e.g.: Computed Aided Diagnosis, CAD)
Steps in Image Processing

- Image acquisition
- Preprocessing
- Segmentation
- Representation and Description
- Recognition
- Interpretation
- Knowledge base
Techniques

- **Inversion** Inverting an image, the RGB value of each pixel is transformed as
  \[
  R' = 1 - R \\
  G' = 1 - G \\
  B' = 1 - B
  \]

- **Enhancement** programs make information more visible.

- **Edge detection** programs sharpen intensity-transition regions.
Techniques (contd....)

- **Convolution** programs are 3-by-3 masks operating on pixel neighbourhoods.
- **Math processes** programs perform a variety of functions.
- **Noise filters** decrease noise by diminishing statistical deviations.
- **Trend removal** programs remove intensity trends varying slowly over the image.
- **Image analysis** programs extract information from an image.
Image Processing Tools

- **Mirametrics** provides off-the-shelf and custom image processing, data analysis, and data visualization solutions for researchers, educators, and students in science and engineering. Our products and services include the Mira software line, OEM applications, and engineering development services for custom imaging applications.
  - Mira Mx
  - Mira Ap
  - Mira Al
  - Mira Pro
  - Pro Script
Tools (contd...)  

- **Lispix** is a public domain image analysis program for Windows, written and maintained by David Bright. While including basic image processing functions found in NIH Image, ImageJ, Scion Image, ImageTool, and in some commercial programs.

- Lispix is useful for processing and analyzing images, and stacks of images or data cubes. Image pixels can be bit, integer, real, complex and color.
Tools (contd…)

- The **Black Ice** imaging toolkits includes many powerful filters and image processing features which can be used in multiple image processing scenarios. The key to successfully using image processing is to know which image processing techniques to use and in what order to use them in order to gain optimal output.
  - Filtering a noisy, scanned, hand written image
  - Finding Defects on an Image
  - Finding Objects on an Image
Tools (contd…)

- **Image Processing Toolbox** provides a comprehensive set of reference-standard algorithms and graphical tools for image processing, analysis, visualization, and algorithm development.
  - Image enhancement, filtering, and deblurring
  - Image analysis, including segmentation, morphology, feature extraction, and measurement
  - Multidimensional image processing
  - Image-sequence and video display
Image Processing Softwares

- **ScanMagic**
  Easy-to-use and powerful image processing software for MS Windows. Allows the user to visualize, manipulate, analyze and process remotely sensed imagery and geospatial data.

- **Viewer Zoom Tool**
  ERDAS provides several new enhancements to the ERDAS IMAGINE Viewer tool, for both 8.3 and 8.3.1 versions. These enhancements are designed to enable users of the software to streamline the process of manipulating data in the Viewer.
Softwares (contd…)

- **Geomatica FreeView**
  Geomatica FreeView allows the viewing, enhancing, and examination of remotely sensed imagery such as LANDSAT, SPOT, RADARSAT, ERS-1, NOAA AVHRR, and aerial photography.

- **MB-System**
  MB-System is a package for the processing and display of bathymetry and backscatter imagery data derived from multibeam, interferometry, and sidescan sonars.
Applications

- Security & Surveillance
- Medical
- Remote Imagery
- Astronomy
- Industrial Robotics
- Television Signal Processing
- Visual Communications
- Automatic Visual Inspection for Manufactured Goods
Future

- The **Photosynth** project demonstrates the stitching together of many images into a very large composite image.
- Efficient utilization of image processing capabilities in the service of plastic surgery.
- **OptiMelt's** built-in digital camera continuously captures real-time images of the samples and uses digital image processing techniques to determine phase transitions.
Any Queries ???
Thank You…