Image Processing

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Abstract: Image processing is a technique in which we apply operations on the image so that the output is a modified image with better image quality and other characteristics. Earlier analog image processing is used which had it demerits like signal distortion and noise. It uses various algorithms for image processing. If the input image is in analog form then it is first converted into digital image to apply digital image processing techniques. It is applied into various areas like machine robot vision, medical field, color processing, pattern recognition etc.

**Keywords:** distortion, signal, noise, algorithms, digital.

Introduction

It is a method where you convert image into digital form so that you can apply some operations on it in order to enhance its picture quality or to extract some information from it. In this method input is digital image and output is image and its characteristics. Here we use computer system which processes image. The most widely used image processing software is Adobe Photoshop. It uses image as two dimensional signals and apply processing methods to them. It basically includes digital image processing, but optical and analog image processing also are possible. Digital image processing is far better than analog processing because in analog processing there are issues like build up noise and signal distortion during processing.

Its applications are in engineering and computer disciplines too.
It includes 3 steps:

1. First scanning the image by digital scanner.
2. Manipulating or analyzing the image using data compression, image enhancement and pattern spotting.
3. Output is the altered image.

How it works?
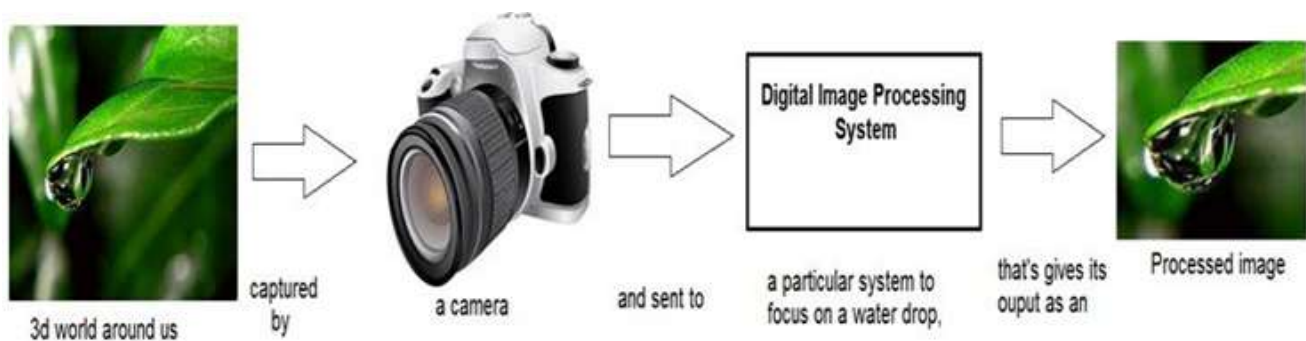
In the image given above, it is clicked by digital camera, and sent to digital system to remove all details. It focuses on the drop and zooming it such that the image quality should be retained.

Types

Image processing is of two types namely analog and digital.

1. Analog techniques are used for printouts and photographs. It uses visual techniques. It uses basic interpretation techniques for image processing. There is another techniques called association which is used along with analog techniques. So analog techniques uses the combination of both association and fundamental processing techniques.
2. In digital image processing we use digital image if the input is in analog format then first is converted into digital image by using digital computer then digital image processing techniques are applied onto it. As the raw data contains some deficiencies, and to get originality of image it goes through various images processing phases which every image undergoes during processing are pre processing, enhancement and display information extraction.
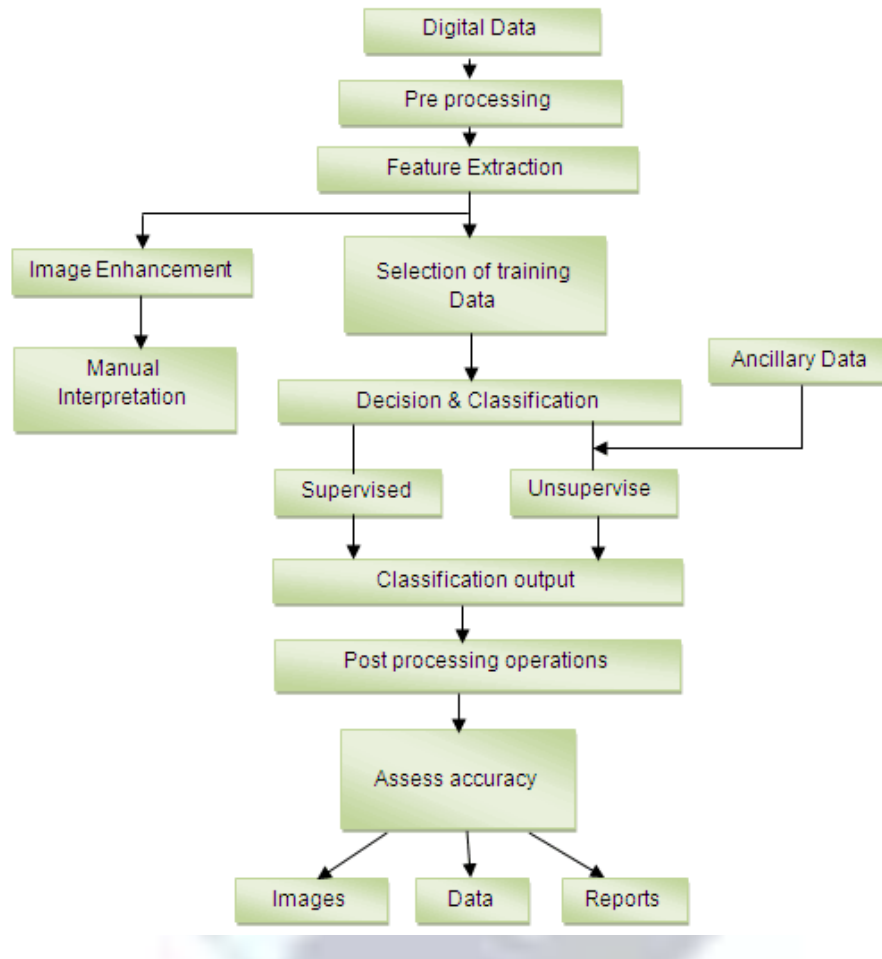
Purpose of Image processing

It is divided into 5 groups. These are: -

1. **Visualization** - Capture those objects which are not visible.
2. **Image sharpening and restoration** – These techniques are used to create a better image.
3. **Image retrieval** – Extract those images which are of interest.
4. **Measurement of pattern** – In image different objects is measured.
5. **Image Recognition** – Images are distinguished from one another.

Tasks

In digital image processing we use complex algorithms. It performs the tasks which would otherwise be impossible by using analog processing. Digital processing is practical technology for:-

- Classification
- Feature extraction

- Pattern recognition
- Projection
- Multi-scale signal analysis

Digital image processing includes:-

- Pixelation
- Linear filtering
- Principal components analysis
- Independent component analysis
- Hidden Markov models
- Anisotropic diffusion
- Partial differential equations
- Self-organizing maps
- Neural networks
- Wavelets

Applications

1. **Transportation Systems** – It is used as intelligent transportation system, in recognition of automatic number plate when it passes a specific point and also helps in traffic sign recognition.
2. **Remote Sensing** – Through satellite it captures earth pictures and their location. Satellite passes these pictures to earth station where these are processed. And this information is used in various purposes like for city planning, agricultural production monitoring etc.
3. **Moving object tracking** – It captures the moving objects and their parameters and record visual. Different approaches are used to track their movement and these are motion based tracking and recognition based tracking.
4. **Defense surveillance** – Aerial surveillance is used to keep track of land and oceans. It is used to keep track of naval vessels. Image processing is used to divide various objects. We use different parameters of image i.e. length, breadth, area, perimeter. It is then divided into different objects and distributes these objects based on the direction of the vessels.
5. **Biomedical Imaging techniques** – Different types of imaging tools are used such as X ray, Ultrasound, MRI etc.
6. **Films** - In movies like Westwood digital image processing is used.
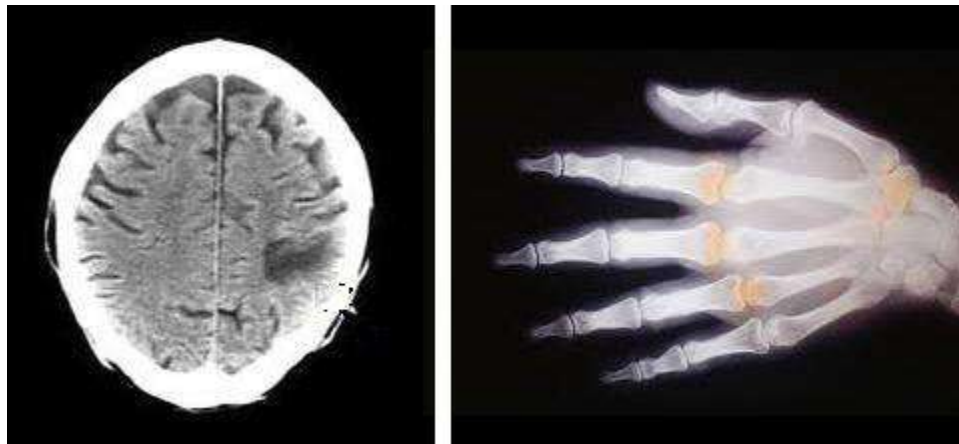
These biomedical images are used in heart disease and lung disease identification and digital mammograms.

7. **Automatic Visual Inspection System** – it improves the quality and productivity in the industries.

8. It is used successfully in various areas like Image sharpening and restoration, Medical field, Remote sensing, Transmission and encoding, Machine/Robot vision, Color processing, Pattern recognition, Video processing, Microscopic Imaging.

Conclusion

Now a day's there is a revolution in computer technology and imaging. Computers able to process and analyze better than human being and it is better than traditional computers. Parallel and distributed paradigms are used to improve response time in image processing. In digital image processing we use digital image as input if image is in analog format then first it is converted into digital format then image processing is applied onto it, and the output is modified image with its characteristics. It is so popular and successful that it is applied in various fields like Image sharpening and restoration, Medical field, Remote sensing, Transmission and encoding, Machine/Robot vision, Color processing, Pattern recognition, Video processing, Microscopic Imaging.

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