

# **EMPIRICAL STUDY OF IMAGE PROCESSING AND ITS DIFFERENT APPLICATIONS**

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## **ABSTRACT**

*This paper is application of image processing techniques for identification of most common Applications Till date there is no proven cure for the disease, hence close monitoring of the disease is important in the medical treatment of this disease. In this paper Fingers and Knee images of the patient having have been analyzed through Morphological Image processing techniques. This includes erosion, dilation, Perimeter determination and Skeletonization. The processed images find their application in the field of Computer Vision, Face Detection, Remote Sensing, Medical Imaging, Microscope image processing, Lane departure warning system, Mathematical morphology and Medical Science, can be beneficial for everyone in identification of disease stages from monitoring point of view.*

**Keywords-component: Morphological Image processing, erosion, dilation, Perimeter determination and Skeletonization.**

## **I. INTRODUCTION**

### **What is Image Processing?**

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them.

It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too.

### **Image processing basically includes the following three steps.**

- Importing the image with optical scanner or by digital photography.
- Analyzing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.
- Output is the last stage in which result can be altered image or report that is based on image analysis.

### **Purpose of Image processing**

The purpose of image processing is divided into 5 groups. They are:

1. Visualization - Observe the objects that are not visible.

2. Image sharpening and restoration - To create a better image.
3. Image retrieval - Seek for the image of interest.
4. Measurement of pattern – Measures various objects in an image.
5. Image Recognition – Distinguish the objects in an image.

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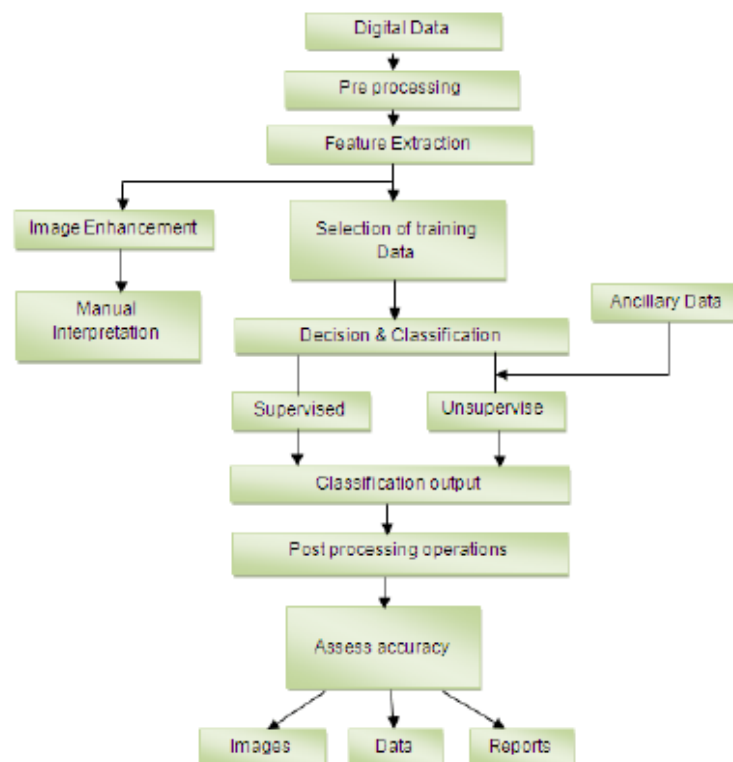


Figure 1 Image Processing Flow Diagram

## II. CURRENT AND FUTURE RESEARCH

A wide research is being done in the Image processing technique.

1. Cancer Imaging – Different tools such as PET, MRI, and Computer aided Detection helps to diagnose and be aware of the tumour.
2. Brain Imaging – Focuses on the normal and abnormal development of brain, brain ageing and common disease states.

3. Image processing – This research incorporates structural and functional MRI in neurology, analysis of bone shape and structure, development of functional imaging tools in oncology, and PET image processing software development.

4. Imaging Technology – Development in image technology have formed the requirement to establish whether new technologies are effective and cost beneficial. This technology works under the following areas:

- Magnetic resonance imaging of the knee
- Computer aided detection in mammography
- Endoscopic ultrasound in staging the oesophageal cancer
- Magnetic resonance imaging in low back pain
- Ophthalmic Imaging – This works under two categories:

5. Development of automated software- Analyzes the retinal images to show early sign of diabetic retinopathy

6. Development of instrumentation – Concentrates on development of scanning laser ophthalmoscope

## Future

We all are in midst of revolution ignited by fast development in computer technology and imaging. Against common belief, computers are not able to match humans in calculation related to image processing and analysis. But with increasing sophistication and power of the modern computing, computation will go beyond conventional, Von Neumann sequential architecture and would contemplate the optical execution too. Parallel and distributed computing paradigms are anticipated to improve responses for the image processing results.

## III. APPLICATIONS OF IMAGE PROCESSING

1. **Computer Vision**-Computer vision is the science and technology of machines that see. As a scientific discipline, computer vision is concerned with the theory for building artificial systems that obtain information from images. The image data can take many forms, such as a video sequence, views from multiple cameras, or multi-dimensional data from a medical scanner. As a technological discipline, computer vision seeks to apply the theories and models of computer vision to the construction of computer vision systems. Computer vision can also be described as a complement (but not necessarily the opposite) of biological vision. In biological vision, the visual perception of humans and various animals are studied, resulting in models of how these systems operate in terms of physiological processes. Computer vision, on the other hand, studies and describes artificial vision system that are implemented in software and/or hardware. Interdisciplinary exchange between biological and computer vision has proven increasingly fruitful for both fields.

2. **Face Detection**- Face detection is a computer technology that determines the locations and sizes of human faces in arbitrary (digital) images. It detects facial features and ignores anything else, such as buildings, trees and bodies. Face detection can be regarded as a specific case of object-class detection; In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class. Face detection can be regarded as a more general case of face localization; In face localization, the task is to find the locations and sizes of a known number of faces (usually one). In face detection, one does not have this additional information. Examples include upper torsos, pedestrians, and cars. Face detection is used in biometrics, often as a part of (or together with) a facial recognition system. It is also used in video surveillance, human computer interface and image database management. Some recent digital cameras use face detection for autofocus[1].

Also, face detection is useful for selecting regions of interest in photo slideshows that use a pan-and-scale Ken Burns effect.

**3. Remote Sensing**—Remote sensing is the small or large-scale acquisition of information of an object or phenomenon, by the use of either recording or real-time sensing device(s) that is not in physical or intimate contact with the object (such as by way of aircraft, spacecraft, satellite, buoy, or ship). In practice, remote sensing is the stand-off collection through the use of a variety of devices for gathering information on a given object or area. Thus, Earth observation or weather satellite collection platforms, ocean and atmospheric observing weather buoy platforms, monitoring of a pregnancy via ultrasound, Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET), and space probes are all examples of remote sensing. In modern usage, the term generally refers to the use of imaging sensor technologies including but not limited to the use of instruments aboard aircraft and spacecraft, and is distinct from other imaging-related fields such as medical imaging.

**4. Medical Imaging**—Medical imaging refers to the techniques and processes used to create images of the human body (or parts thereof) for clinical purposes (medical procedures seeking to reveal, diagnose or examine disease) or medical science (including the study of normal anatomy and physiology). As a discipline and in its widest sense, it is part of biological imaging and incorporates radiology (in the wider sense), radiological sciences, endoscopy, (medical) thermography, medical photography and microscopy (e.g. for human pathological investigations). Medical imaging is often perceived to designate the set of techniques that noninvasively produce images of the internal aspect of the body. In this restricted sense, medical imaging can be seen as the solution of mathematical inverse problems. This means that cause (the properties of living tissue) is inferred from effect (the observed signal). In the case of ultrasonography the probe consists of ultrasonic pressure waves and echoes inside the tissue show the internal structure. In the case of projection radiography, the probe is X-ray radiation which is absorbed at different rates in different tissue types such as bone, muscle and fat.

**5. Microscope image processing**—Microscope image processing is a broad term that covers the use of digital image processing techniques to process, analyze and present images obtained from a microscope. Such processing is now commonplace in a number of diverse fields such as medicine, biological research, cancer research, drug testing, metallurgy, etc. A number of manufacturers of microscopes now specifically design in features that allow the microscopes to interface to an image processing system. Until the early 1990s, most image acquisition in video microscopy applications was typically done with an analog video camera, often simply closed circuit TV cameras. While this required the use of a frame grabber to digitize the images, video cameras provided images at full video frame rate (25-30 frames per second) allowing live video recording and processing. While the advent of solid state detectors yielded several advantages, the real-time video camera was actually superior in many respects.

**6. Lane departure warning system**—In road-transport terminology, a lane departure warning system is a mechanism designed to warn a driver when the vehicle begins to move out of its lane (unless a turn signal is on in that direction) on freeways and arterial roads. The first production lane departure warning system in Europe was the system developed by Iteris for Mercedes Actros commercial trucks. The system debuted in 2000 and is now available on most trucks sold in Europe. In 2002, the Iteris system became available on Freightliner Trucks' trucks in North America. In all of these systems, the driver is warned of unintentional lane departures by an

audible rumble strip sound generated on the side of the vehicle drifting out of the lane. If a turn signal is used, no warnings are generated.

**7. Mathematical morphology**-Mathematical morphology (MM) is a theory and technique for the analysis and processing of geometrical structures, based on set theory, lattice theory, topology, and random functions. MM is most commonly applied to digital images, but it can be employed as well on graphs, surface meshes, solids, and many other spatial structures. Topological and geometrical continuous-space concepts such as size, shape, convexity, connectivity, and geodesic distance, can be characterized by MM on both continuous and discrete spaces. MM is also the foundation of morphological image processing, which consists of a set of operators that transform images according to the above characterizations. MM was originally developed for binary images, and was later extended to grayscale functions and images. The subsequent generalization to complete lattices is widely accepted today as MM's theoretical foundation.

## IV. ADVANTAGES DISADVANTAGES

### Advantages

- This one is more accurate than the overlapping method because it is based upon minutia.
- It is an interactive method for recognizing fingerprints.

### Disadvantages

- It is more time consuming as compared to the former.
- More complex program.

## V. CONCLUSION

Using image processing techniques, we can sharpen the images, contrast to make a graphic display more useful for display, reduce amount of memory requirement for storing image information, etc., due to such techniques, image processing is applied in recognition of images' as in factory floor quality assurance systems; image enhancement', as in satellite reconnaissance systems; image synthesis' as in law enforcement suspect identification systems, and image construction' as in plastic surgery design systems.

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