**A Review Report on Image Processing**

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***Abstract***

*Image and Video Processing are hot subjects in the discipline of research and improvement. Image processing is any form of sign processing for which the input is a photo, which includes pics or frames of video; the output of photograph processing can be both a photo or a set of traits or parameters related to the photograph. Most photo-processing techniques contain treating the picture as a -dimensional signal and applying well-known signal-processing techniques to it. Video processing is a selected case of sign processing, where the input and output alerts are video documents or video streams. Video processing strategies are utilized in television sets, VCRs, DVDs, video codecs, video players and different devices. In This paper, we gift Image and Video processing elements. We also present the contemporary technologies related to Image and Video Processing.*

***Keywords:*** *Image Processing, Video Processing, Digital Image, Multimedia*

# Introduction

# Image processing generally refers to digital photograph processing, however optical and analog photo processing also are possible. The acquisition of pix (generating the input image in the first location) is called imaging. [1] Digital video is a type of video recording device that works via the use of a digital rather than an analog video sign. The terms camera, video camera, and camcorder are used interchangeably in this article. [2] In the subsequent sections of this paper, we can talk the elements of Digital Image Processing. We will even speak the factors of Digital Video Processing. And finally, we will evaluation the modern-day technology and techniques in the fields.

# Digital Image Processing

Digital Images are produced by means of a spread of physical devices, together with nevertheless and video cameras, x-ray gadgets, electron microscopes, radar, and ultrasound, and used for a selection of purposes, together with amusement, clinical, enterprise (e.g. Documents), business, navy, civil (e.g. Site visitors), safety, and medical. The intention in every case is for an observer, human or gadget, to extract useful information about the scene being imaged. An instance of a commercial utility is proven in Figure 1. Often the raw photograph is not immediately suitable for this reason, and ought to be processed in some way. Such processing is known as picture enhancement; processing by using an observer to extract records is referred to as photo analysis. Enhancement and analysis are prominent by means of their output, snap shots vs. Scene facts, and by way of the challenges faced and techniques employed. Image enhancement has been done by chemical, optical, and electronic manner, at the same time as evaluation has been done in general by people and electronically.

Digital photograph processing is a subset of the digital area in which the image is converted to an array of small integers, referred to as pixels, representing a bodily quantity consisting of scene radiance, saved in a virtual reminiscence, and processed by using computer or different digital hardware. Digital photo processing, both as enhancement for human observers or performing autonomous analysis, offers advantages in value, pace, and flexibility, and with the swiftly falling price and growing performance of personal computer systems it has emerge as the dominant approach in use. [3]

A photo isn't always an instantaneous size of the houses of bodily gadgets being regarded. Rather it's miles a complicated interaction amongst several physical methods: the depth and distribution of illuminating radiation, the physics of the interaction of the radiation with the problem comprising the scene, the geometry of projection of the meditated or transmitted radiation from 3 dimensions to the two dimensions of the photograph aircraft, and the electronic traits of the sensor. Unlike for example writing a compiler, wherein a set of rules sponsored with the aid of formal idea exists for translating an excessive-level pc language to device language, there is no set of rules and no similar concept for extracting scene statistics of interest, which includes the location or great of an article of manufacture, from a photo. [3]

The mission is regularly underappreciated with the aid of beginner customers due to the seeming effortlessness with which their own visible system extracts records from scenes. Human imaginative and prescient is distinctly extra state-of-the-art than something we are able to engineer at present and for the foreseeable destiny. Thus one need to be careful no longer to evaluate the issue of a virtual picture processing application on the basis of ways it appears to humans. [3]

Perhaps the primary guiding important is that human beings are higher at judgement and machines are higher at measurement. Thus figuring out the right role and size of a car part on a conveyer, for instance, is properly-appropriate for virtual image processing, while grading apples or wood is quite a bit extra difficult (although no longer not possible). Along these lines photo enhancement, which typically requires lots of numeric computation however little judgement, is nicely-suited for digital processing. [3]

If teasing beneficial facts out of the soup that is an image isn’t challenging enough, the problem is similarly complex with the aid of often excessive time budgets. Few users care if a spreadsheet takes 300 milliseconds to replace instead of 200, but maximum commercial packages, as an example, have to perform within tough constraints imposed by way of machine cycle times. There also are many applications, such as ultrasound photo enhancement, site visitors tracking, and camcorder stabilization, that require real-time processing of a video circulate. To make the rate undertaking concrete, keep in mind that the video circulate from a general monochrome video digital camera produces round 10 million pixels per 2d. As of this writing the everyday laptop PC can execute perhaps 50 gadget commands in a hundred ns. Available to procedure every pixel. [3]

The set of factors you could do in a trifling 50 instructions is rather constrained. On pinnacle of this many virtual photo processing applications are confined by way of severe fee objectives. Thus we regularly face the engineer’s dreaded triple curse, the want to design something excellent, fast, and cheap. [3]

# Application of Digital Image Processing

Digital Image Processing is applied in the fields of Computer vision, Face detection, Feature detection, Lane departure warning system, Non-photorealistic rendering, Medical image processing, Microscope image processing Morphological image processing, Remote sensing, etc.

### **Computer vision**

Computer imaginative and prescient is the technology and era of machines that see. As a systematic subject, computer vision is concerned with the principle for constructing synthetic systems that achieve records from pix. The photo facts can take many paperwork, which includes a video collection, views from multiple cameras, or multi- dimensional information from a scientific scanner. [4]

As a technological subject, pc imaginative and prescient seeks to apply its theories and fashions to the development of pc imaginative and prescient structures. Examples of applications of pc imaginative and prescient encompass systems for:

• Controlling strategies (e.g., an industrial robot or a self-reliant car).

• Detecting activities (e.g., for visible surveillance or people counting).

• Organizing records (e.g., for indexing databases of photographs and picture sequences).

• Modeling items or environments (e.g., business inspection, scientific image analysis or topographical modeling).

• Interaction (e.g., as the input to a tool for pc-human interplay).

Computer vision also can be described as a supplement (but not always the alternative) of organic vision. In organic vision, the visual perception of human beings and numerous animals are studied, resulting in models of ways these structures perform in phrases of physiological techniques. Computer vision, then again, research and describes synthetic vision gadget this is implemented in software program and/or hardware. Interdisciplinary change between organic and computer imaginative and prescient has confirmed an increasing number of fruitful for each fields.

Sub-domain names of computer imaginative and prescient encompass scene reconstruction, occasion detection, video tracking, item recognition, mastering, indexing, motion estimation, and photo recovery.

**3.1.1 Applications of Computer vision.**

One of the most prominent application fields is medical computer vision or medical image processing. This area is characterized by the extraction of information from image data for the purpose of making a medical diagnosis of a patient. Generally, image data is in the form of microscopy images, X-ray images, angiography images, ultrasonic images, and tomography images. An example of information which can be extracted from such image data is detection of tumours, arteriosclerosis or other malign changes. It can also be measurements of organ dimensions, blood flow, etc. This application area also supports medical research by providing new information, e.g., about the structure of the brain, or about the quality of medical treatments.

A second application area in computer vision is in industry, sometimes called machine vision, where information is extracted for the purpose of supporting a manufacturing process. One example is quality control where details or final products are being automatically inspected in order to find defects. Another example is measurement of position and orientation of details to be picked up by a robot arm.

Military applications are probably one of the largest areas for computer vision. The obvious examples are detection of enemy soldiers or vehicles and missile guidance. More advanced systems for missile guidance send the missile to an area rather than a specific target, and target selection is made when the missile reaches the area based on locally acquired image data. Modern military concepts, such as "battlefield awareness", imply that various sensors, including image sensors, provide a rich set of information about a combat scene which can be used to support strategic decisions. In this case, automatic processing of the data is used to reduce complexity and to fuse information from multiple sensors to increase reliability.

Artist's Concept of Rover on Mars, an example of an unmanned land-based vehicle. Notice the stereo cameras mounted on top of the Rover. (credit: Maas Digital LLC)

One of the newer application areas is autonomous vehicles, which include submersibles, land-based vehicles (small robots with wheels, cars or trucks), aerial vehicles, and unmanned aerial vehicles (UAV). The level of autonomy ranges from fully autonomous (unmanned) vehicles to vehicles where computer vision based systems support a driver or a pilot in various situations. Fully autonomous vehicles typically use computer vision for navigation, i.e. for knowing where it is, or for producing a map of its environment (SLAM) and for detecting obstacles. It can also be used for detecting certain task specific events, e. g., a UAV looking for forest fires. Examples of supporting systems are obstacle warning systems in cars, and systems for autonomous landing of aircraft. Several car manufacturers have demonstrated systems for autonomous driving of cars, but this technology has still not reached a level where it can be put on the market. There are ample examples of military autonomous vehicles ranging from advanced missiles, to UAVs for recon missions or missile guidance. Space exploration is already being made with autonomous vehicles using computer vision, e. g., NASA's Mars Exploration Rover. Other application areas include:

* Support of visual effects creation for cinema and broadcast, e.g., camera tracking (matchmoving).
* Surveillance.

### **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. Examples include upper torsos, pedestrians, and cars.

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.

Early face-detection algorithms focused on the detection of frontal human faces, whereas newer algorithms attempt to solve the more general and difficult problem of multi-view face detection. That is, the detection of faces that are either rotated along the axis from the face to the observer (in-plane rotation), or rotated along the vertical or left-right axis (out-of-plane rotation), or both.

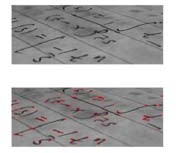
Many algorithms implement the face-detection task as a binary pattern- classification task. That is, the content of a given part of an image is transformed into features, after which a classifier trained on example faces decides whether that particular region of the image is a face, or not.

Often, a window-sliding technique is employed. That is, the classifier is used to classify the (usually square or rectangular) portions of an image, at all locations and scales, as either faces or non-faces (background pattern).

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

### **Feature detection**

In computer vision and image processing the concept of feature detection refers to methods that aim at computing abstractions of image information and making local decisions at every image point whether there is an image feature of a given type at that point or not. The resulting features will be subsets of the image domain, often in the form of isolated points, continuous curves or connected regions. [7]



**Figure 1. Output of a typical corner detection algorithm**

There is no universal or exact definition of what constitutes a feature, and the exact definition often depends on the problem or the type of application. Given that, a feature is defined as an "interesting" part of an image, and features are used as a starting point for many computer vision algorithms. Since features are used as the starting point and main primitives for subsequent algorithms, the overall algorithm will often only be as good as its feature detector. Consequently, the desirable property for a feature detector is repeatability: whether or not the same feature will be detected in two or more different images of the same scene.

Feature detection is a low-level image processing operation. That is, it is usually performed as the first operation on an image, and examines every pixel to see if there is a feature present at that pixel. If this is part of a larger algorithm, then the algorithm will typically only examine the image in the region of the features. As a built-in pre-requisite to feature detection, the input image is usually smoothed by a Gaussian kernel in a scale-space representation and one or several feature images are computed, often expressed in terms of local derivative operations.

Occasionally, when feature detection is computationally expensive and there are time constraints, a higher level algorithm may be used to guide the feature detection stage, so that only certain parts of the image are searched for features. [7]

Where many computer vision algorithms use feature detection as the initial step, so as a result, a very large number of feature detectors have been developed. These vary widely in the kinds of feature detected, the computational complexity and the repeatability. At an overview level, these feature detectors can (with some overlap) be divided into the following groups:

* + - **Edges -** Edges are points where there is a boundary (or an edge) between two image regions. In general, an edge can be of almost arbitrary shape, and may include junctions. In practice, edges are usually defined as sets of points in the image which have a strong gradient magnitude. Furthermore, some common algorithms will then chain high gradient points together to form a more complete description of an edge. These algorithms usually place some constraints on the properties of an edge, such as shape, smoothness, and gradient value. Locally, edges have a one dimensional structure.
    - **Corners / interest points -** The terms corners and interest points are used somewhat interchangeably and refer to point-like features in an image, which have a local two dimensional structure. The name “Corner” arose since early algorithms first performed edge detection, and then analyzed the edges to find rapid changes in direction (corners). These algorithms were then developed so that explicit edge detection was no longer required, for instance by looking for high levels of curvature in the image gradient. It was then noticed that the so-called corners were also being detected on parts of the image which were not corners in the traditional sense (for instance a small bright spot on a dark background may be detected). These points are frequently known as interest points, but the term "corner" is used by tradition.
    - **Blobs / regions of interest or interest points** - Blobs provide a complementary description of image structures in terms of regions, as opposed to corners that are more point-like. Nevertheless, blob descriptors often contain a preferred point (a local maximum of an operator response or a center of gravity) which means that many blob detectors may also be regarded as interest point operators. Blob detectors can detect areas in an image which are too smooth to be detected by a corner detector. Consider shrinking an image and then performing corner detection. The detector will respond to points which are sharp in the shrunk image, but may be smooth in the original image. It is at this point that the difference between a corner detector and a blob detector becomes somewhat vague. To a large extent, this distinction can be remedied by including an appropriate notion of scale. Nevertheless, due to their response properties to different types of image structures at different scales, the LoG and DoH blob detectors are also mentioned in the article on corner detection.
    - **Ridges -** For elongated objects, the notion of ridges is a natural tool. A ridge descriptor computed from a grey-level image can be seen as a generalization of a medial axis. From a practical viewpoint, a ridge can be thought of as a one-dimensional curve that represents an axis of symmetry, and in addition has an attribute of local ridge width associated with each ridge point. Unfortunately, however, it is algorithmically harder to extract ridge features from general classes of grey-level images than edge-, corner- or blob features. Nevertheless, ridge descriptors are frequently used for road extraction in aerial images and for extracting blood vessels in medical images -- see ridge detection.

### **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. [8]

The first production lane departure warning system in Europe was the system developed by America's 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.

More effective lane departure warning systems are now combining prevention with risk reports in the transportation industry. Viewnyx applies video based technologies to assist fleets in lowering their driving liability costs. Firstly, by addressing the main causes of collisions: driving error, distraction and drowsiness. Secondly, by providing Safety Managers with driver and fleet risk assessment reports and tools to facilitate proactive coaching & training to eliminate high risk behaviors. The Lookout solution is currently being used by North American fleets. There are two main types of systems:

* + - systems which warn the driver if the vehicle is leaving its lane.
    - systems which warn the driver and if no action is taken automatically take steps to ensure the vehicle stays in its lane.

### **Non-photorealistic rendering**

Non-photorealistic rendering (NPR) is an area of computer graphics that focuses on enabling a wide variety of expressive styles for digital art. In contrast to traditional computer graphics, which has focused on photorealism, NPR is inspired by artistic styles such as painting, drawing, technical illustration, and animated cartoons. NPR has appeared in movies and video games in the form of “toon shaders," as well as in architectural illustration and experimental animation. An example of a modern use of this method is that of Cel-shaded animation.

### **Medical image processing**

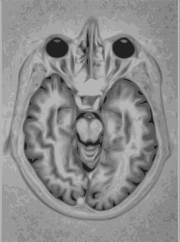
Medical imaging is the technique and process used to create images of the human body (or parts and function thereof) for clinical purposes (medical procedures seeking to reveal, diagnose or examine disease) or medical science (including the study of normal anatomy and physiology).

As a discipline and in its widest sense, it is part of biological imaging and incorporates radiology (in the wider sense), nuclear medicine, investigative radiological sciences, endoscopy, (medical) thermography, medical photography and microscopy (e.g. for human pathological investigations).

Measurement and recording techniques which are not primarily designed to produce images, such as electroencephalography (EEG), magnetoencephalography (MEG), Electrocardiography (EKG) and others, but which produce data susceptible to be represented as maps (i.e. containing positional information), can be seen as forms of medical imaging.

**3.6.1 Magnetic resonance imaging (MRI).**

A magnetic resonance imaging instrument (MRI scanner), or "nuclear magnetic resonance (NMR) imaging" scanner as it was originally known, uses powerful magnets to polarise and excite hydrogen nuclei (single proton) in water molecules in human tissue, producing a detectable signal which is spatially encoded, resulting in images of the body. MRI uses three electromagnetic fields: a very strong (on the order of units of teslas) static magnetic field to polarize the hydrogen nuclei, called the static field; a weaker time-varying (on the order of 1 kHz) field(s) for spatial encoding, called the gradient field(s); and a weak radio-frequency (RF) field for manipulation of the hydrogen nuclei to produce measurable signals, collected through an RF antenna. [9]



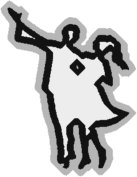
**Figure 2. A brain MRI representation**

Like CT, MRI traditionally creates a two dimensional image of a thin “slice" of the body and is therefore considered a tomographic imaging technique. Modern MRI instruments are capable of producing images in the form of 3D blocks, which may be considered a generalization of the single-slice, tomographic, concept. Unlike CT, MRI does not involve the use of ionizing radiation and is therefore not associated with the same health hazards. For example, because MRI has only been in use since the early 1980s, there are no known long-term effects of exposure to strong static fields (this is the subject of some debate; see 'Safety' in MRI) and therefore there is no limit to the number of scans to which an individual can be subjected, in contrast with X-ray and CT. However, there are well-identified health risks associated with tissue heating from exposure to the RF field and the presence of implanted devices in the body, such as pace makers. These risks are strictly controlled as part of the design of the instrument and the scanning protocols used.

Because CT and MRI are sensitive to different tissue properties, the appearance of the images obtained with the two techniques differ markedly. In CT, X-rays must be blocked by some form of dense tissue to create an image, so the image quality when looking at soft tissues will be poor. In MRI, while any nucleus with a net nuclear spin can be used, the proton of the hydrogen atom remains the most widely used, especially in the clinical setting, because it is so ubiquitous and returns a large signal. This nucleus, present in water molecules, allows the excellent soft-tissue contrast achievable with MRI.

### **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.



**Figure 3. A shape (in black) and its morphological dilation (in grey) and erosion (in white) by a diamond-shape structuring element.**

### **Morphological image processing**

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. [10]

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.

### **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 are wireless, or 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, the monitoring of a parolee via an ultrasound identification system, Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET), X-radiation (X-RAY) and space probes are all examples of remote sensing. In modern usage, the term generally refers to the use of imaging sensor technologies including: instruments found in aircraft and spacecraft as well as those used in electrophysiology, and is distinct from other imaging-related fields such as medical imaging. [11]

There are two kinds of remote sensing. Passive sensors detect natural radiation that is emitted or reflected by the object or surrounding area being observed. Reflected sunlight is the most common source of radiation measured by passive sensors. Examples of passive remote sensors include film photography, Infrared, charge-coupled devices, and radiometers. Active collection, on the other hand, emits energy in order to scan objects and areas whereupon a sensor then detects and measures the radiation that is reflected or backscattered from the target. RADAR is an example of active remote sensing where the time delay between emission and return is measured, establishing the location, height, speed and direction of an object.

Remote sensing makes it possible to collect data on dangerous or inaccessible areas. Remote sensing applications include monitoring deforestation in areas such as the Amazon Basin, the effects of climate change on glaciers and Arctic and Antarctic regions, and depth sounding of coastal and ocean depths. Military collection during the cold war made use of stand-off collection of data about dangerous border areas.

Remote sensing also replaces costly and slow data collection on the ground, ensuring in the process that areas or objects are not disturbed.

Orbital platforms collect and transmit data from different parts of the electromagnetic spectrum, which in conjunction with larger scale aerial or ground- based sensing and analysis, provides researchers with enough information to monitor trends such as El Niño and other natural long and short term phenomena. Other uses include different areas of the earth sciences such as natural resource management, agricultural fields such as land usage and conservation, and national security and overhead, ground-based and stand-off collection on border areas. [12]

# Digital Video

In electrical engineering and computer science, video processing is a particular case of signal processing, where the input and output signals are video files or video streams. Video processing techniques are used in television sets, VCRs, DVDs, video codecs, video players and other devices. For example—commonly only design and video processing is different in TV sets of different manufactures. [13]

In terms of video codecs video filters are divided into three parts:

* Prefilters: used before encoding
* Intrafilters: inside of codec
* Postfilters: used after decoding

Common prefilters are following:

* Video denoising,
* Size conversion (commonly downsampling)
* Contrast enhancement
* Deinterlacing
* Deflicking, etc.

As intrafilter in current standards only deblocking is used. Common postfilters are following:

* Deinterlacing (to convert interlaced video to progressively scanned)
* Deblocking
* Deringing

# Related Technologies

### **Edge Detection in Image Space Based-on Graphics Hardware Programming**

Modern programmable graphics hardware was primarily designed for 3D object rendering pipeline, it is not intended to solve image-processing problem with its hardware architectures. One way to realize image processing is to copy the contents in a pixel-buffer into main memory, and to process it in normal way supported by CPU. The post-processing result would be converted to an OpenGL texture object and transferred it back into texture memory for further use. This will lead the performance problem. In this paper, we choose to do image processing with graphics hardware instructions. Since the graphics pipeline provides 4-way vector parallel streaming-oriented processing techniques, it will be more efficient in image processing. Considering the fact that Z-depth buffer image is gray-scale and its abrupt changes primarily caused by silhouette profiles, which often have strong connectivity features. We adopt Kirsh operator to detect discontinuity edges in Z- depth buffer. On the other hand, the normal buffer contains RGB that represents the fragment normal vector; we can use dot product value of neighbor texels to inspect the abrupt changes of normal. [14]

### **Triangulation Shape Interpolation**

At morph time t, each triangle in the intermediate shape is generated by interpolating the corresponding triangle pair between the source and target shapes using the stick interpolation. All of these interpolated intermediate triangles are then assembled together to form the intermediate triangulation. However, these intermediate triangles cannot be assembled together tightly because each triangle was interpolated individually such that the corresponding edges of two neighboring interpolated triangles may have different lengths and angles. Another is, they used an optimization method that minimizes the overall local deformation to deal with this problem. Though such approach is very reasonable and precise, it requires much computation cost. In this section we introduce an approach that can perform triangulation shape interpolation very fast. [15]

**5.2.1 Assembly Order Decision.**

All of the intermediate triangles are assembled together one by one according to a predetermined order to generate the intermediate triangle shape. A planar graph [19] is built first from the triangulation according to its position. One triangle is chosen as the root triangle. The root triangle is the foremost in the assembly order. The remainder assembly order is obtained by traversing the planar graph from the root in breadth-first order.

### **Thinning and Smoothing the 3D Feature Lines**

We will thin out each strip by considering each of the edges that it contains as a candidate for the final feature edge, and eliminating candidates until a topologically valid edge has been created. [16]

For each strip, we now consider all the edges which contribute to a single triangle, and classify this triangle into one of three cases, taking appropriate action in each case:

Case 1: If all the edges of the triangle contribute to that triangle only, then we look at the valency of the triangle’ s vertices. Any edges which terminate in a vertex of vanlency two are removed from the candidate set. Thus, edges

∂ e1 and ∂ e3 will be eliminated. If there are no vertices with a valency as low as 2, then one edge is chosen at random and removed from the set of candidates.

Case 2: If only two edges of the triangle are candidates for elimination, because the third edge contributes to another triangle, then we select one of the two edges which are available, at random, and eliminate it from the set of candidates. Sometimes two triangles of this case meet. removing one of the candidate edge from one triangle will, of course, change the other triangle to Case 1.

Case 3: If there is only one candidate edge in a triangle, it can be straightforwardly eliminated from the candidate set.

Note that, in all cases, at least one edge is eliminated from the set of candidates. This process is repeated until no complete triangles are left in the edge ’strips’. However, there will usually be many hanging edges remaining, and possibly branches consisting of several feature edges linked end to end. These can all be eliminated by simple topological considerations. Now we have feature lines that are topologically correct, but jagged. We use a visibility graph method to smooth them. Again, we consider every segment of the jagged feature edge as a candidate for the smoothed edge, but in this case we will amalgamate edges instead of eliminating them. Suppose that p is a vertex shared by two candidate segments of the feature edge, labelled pp1 and pp2. We construct two spheres with pp1 and pp2 as diameters. If these two spheres intersect, we will remove both pp1, pp2 and the vertex p, and insert a new edge p1p2, into the feature line. Otherwise, both edges will remain preserved in the set of candidates

# Conclusion

Image Processing is the act of examining images for the purpose of identifying objects and judging their significance" Image analyst study the remotely sensed data and attempt through logical process in detecting, identifying, classifying, measuring and evaluating the significance of physical and cultural objects, their patterns and spatial relationship. Video processing is a particular case of signal processing, where the input and output signals are video files or video streams. Video processing techniques are used in television sets, VCRs, DVDs, video players and other devices. Image and Video Processing is very helpful in many ways. In this paper, we discuss the elements of Digital Image Processing. We will also discuss the elements of Digital Video Processing. And lastly, we also review the current technologies and techniques in the fields.

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