A Through Study of Image Processing and Its Applications

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Abstract— The image processing is a huge number of applications is to extract significant features from image data, from which a description, interpretation can be provided by the machine. Image processing can be defined as the processing or modifying a present image in a preferred manner. This system allows the user to take hard copy of the image using printer routines and allows the user to store screen image into the disk file using the file format as bmp, jpg, gif [1]. Image processing in its general form pertains to the alteration and analysis of pictorial information. A number of different sensors will be used in the satellites orbiting the earth. All useful information will be extracted from these systems. New logics can be needed to provide and classify the different sets of data obtainable from the orbiting satellites. The future trend in remote sensing will be based on sensors that can record the same scene in many different ways. Graphics data will be important in image processing applications. The Satellite based imaging for planetary exploration as well as military applications will be the future trend. Biomedical applications, astronomy, and scene analysis for the robotic vehicles are also pertinent areas of future applications of imaging [5]. Adaptive search of large image data bases will become the norms, since video and graphics data will be available from a variety of sensors developed for remote sensing applications of satellite systems.

Key words: Alteration and Analysis, remote sensing, Artificial intelligence, Pictorial information

I. INTRODUCTION

Image Processing is a method to enhance raw images received from cameras and sensors placed on satellites, space probes and aircrafts or pictures taken in normal daily life for various applications. A variety of techniques have been residential in Image Processing during the last four to five decades. Image processing is the study of any algorithm that takes an image as input and profits an image as output. The mostly techniques are developed for enhancing images obtained from spacecrafts, space probes and military reconnaissance flights. Digital computer is processed in image processing [7]. Image Processing systems are becoming popular due to easy accessibility of powerful personnel computers, large size memory devices, graphics software's. The common steps for image processing are image scanning, storing, enhancing and interpretation. The various Image Processing techniques are: 1. Image display and printing 2.Image editing and manipulation 3.Image enhancement 4.Feature detection 5.Image compression. The image will be converted into digital form using a scanner – digitizer and then process it. This information is all process by a computer and it makes all the decisions.

II. PURPOSE OF IMAGE PROCESSING:

The chart information is the most important type of information perceived, processed and interpret by the human brain. One third of the cortical area of the human brain is dedicated to visual information processing [8]. The image processing is a computer-based technology, carries out automatic processing, handling and understanding of such visual information, and it plays an increasingly important role in many aspect of our daily life the variety of discipline and field in science and technology, with applications such as television, photography, robotics, remote sensing, medical diagnosis and industrial inspection [3].

- Computerized photography is a Photoshop.
- Space image processing is a Hubble space telescope images, interplanetary probe images.
- Health and organic image processing is like that understanding of X-ray images, blood and cellular microscope images.
- Automatic character recognition is a zip code and license plate recognition.
- Finger print, face and iris recognition.
- Remote sensing is an aerial and satellite image interpretation.
- Reconnaissance
- The image processing is used for Industrial an application that is product assessment and sorting.

The Importance and essential of image processing systems can be using two principal.

The Application area is the first were being the advance of pictorial information for Human understanding and the next is the Processing of a scene data for an Autonomous machine perception. Image processing has a broad area of Applications such as remote sensing, image and data storage for transmission in Business applications, medical imaging,

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III. APPLICATIONS OF IMAGE PROCESSING:

The Image processing is being useful in many fields in today's world.

1) Automotive sector: In Emerging advanced drivers support for semi-autonomous cars and also heavily used in autonomous and driver-less cars.
2) Image enhancing: The camera apps in smart phones and digital cameras using image processing to enhance the image quality, video stabilization and noise removal.
3) Robotics: The Mobile robot's navigation in unknown environment (SLAM), control of the robot by processing the video feed from the camera on robot to extract the live scene around it.
4) Gaming: Advanced gaming consoles like Xbox knelt uses image processing from motion analysis of the human player.
5) Difficulties and specific solutions: image processing is used as a solution to a variety of problems, starting from facial recognition access to defects identification in manufacturing industries [2].
6) Manufacturing: To recognize defect in the processes and also to control the robots in performing certain tasks. It defect in manufacturing of a Printed Circuit Board (PCB) can be experimental using high resolution image processing.
7) Human machine interface: machines are made smart by adding gestural interface, or human action response interfaces, which decodes the actions of the human user to perform certain tasks.

IV. PRINCIPLES OF IMAGE PROCESSING

The purpose of image processing is divided into 5 groups.

1) Visualization – Examine the objects that are not visible.
2) Image file and decode - To create a better image.
3) Image retrieval - Seek for the image of interest.
4) Evaluation of pattern – The Size of various objects in an image.
5) Image View – Differentiate the objects in an image.

Image processing mostly includes the following three steps.

The import the image with visual scanner or by digital picture making.

The inspect and manipulating the image which includes data compression and image augmentation and spotting patterns that are not to human eyes like satellite photographs.

The Output is the last phase in which consequence can be altered image or report that is base on image analysis.

The Image can examine use of various fundamentals of understanding while using these visual techniques. The image processing is not just little to area that has to be considered but on knowledge of analyst. Association is another important tool in image processing through visual techniques. So examine to apply a combination of personal knowledge and Security data to image processing. As raw data from imaging sensors from satellite platform contains deficiency. To get over such flaws and to get originality of information, it has to undergo various phases of processing.

V. RESPONSIBILITIES OF IMAGE PROCESSING:

- There are 3 major responsibilities used for image processing.
- Image acquisition, storage, transmission: digitization/quantization, compression,
- Encoding and decoding.
- Image Enhancement and Restoration: It's used to improvement of pictorial information for human interpretation; both input and output are in the image form.
- Image accepting and Image Recognition: information mining from images for further computer production. Input is in image form, but output is some none image representation of the image content, such as description, interpretation, classification [9].
- Pre-processing stage of computer vision of an artificial intelligent system is a robot, Autonomous vehicles.

VI. TECHNIQUES OF IMAGE PROCESSING

A. Image Analysis:

Image analysis is concerned with making quantitative dimensions for an image to produce a report of its. Image analysis technique require extraction of certain features that aid in the identification of the object [6]. The Segmentation of technique is used to separate the desired object from the scene so that dimensions can be made on it subsequently [4]. The Quantitative dimensions of object features allow allocate and report of the image.

B. Image Segmentation:

Image segmentation is the process that subdivides an image into its constituent parts or objects. The level to which this subdivision is carried out depends on the problem being solved, that the segmentation should stop when the objects of interest in an application have been isolated for autonomous air-to-ground target acquisition. The image thresholding technique are used for image segmentation.

C. Classification:

The Classification is the labeling of a pixel or a group of pixels based on its grey value. Categorization is one of the most often used methods of information extraction.

D. Image Renovation:

The image Renovation refers to removal or minimization of degradations in an image. The images can be tainted by the limits of a sensor or its environment, noise filter, and rectification of geometric modification or non-linearity due to sensors.

E. Image Compression:

Compression is a very necessary tool for archiving image data, image data transfer on the network. They are various

techniques available for loss and lossless compressions. One of the most popular compression technique can be used for image processing. JPEG is a Joint Photographic Experts Group for uses Discrete Cosine Transformation (DCT) Based compression technique. The currently wavelet based compression techniques are used for higher compression ratios with minimal loss of data.

F. Edge Detection:

Edge detection is area of significant change in the image greatness or similarity. Another word for edge detection is image segmentation. Canny edge detection process is used to detect the edges in the preprocessed images.

VII. CONCLUSION

The major object for automatic image analysis is that the pure complexity of the visual task which has been mostly ignored by the current approaches [10]. New logical breakthrough in the areas of digital calculation and telecommunication has relevance for future applications of image processing. The satellite imaging and remote sensing application programs of the quality a selection of sensors orbit the earth. This technology is required for military and other types of surveillance, statistical data collection in the fields of forestry, agriculture, disaster prediction, weather prediction [10].In order to extract scientifically useful information, it will be necessary to develop techniques to register real-time data recorded by a variety of sensors for various applications. The ultimate image processing applications of satellite based imaging ranges from planetary exploration to surveillance applications.

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