



Research Challenges in Image Processingan Overview

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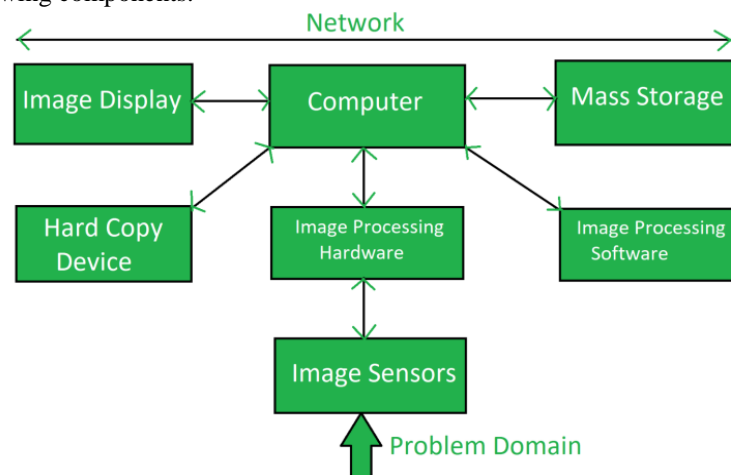
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Abstract. Image processing is a method of actually performing operations on an image in order to improve it or acquire useful data from it. It is a type of signal processing in which the input is an image and the output can be an image or image characteristics/features. It involves three steps namely importing the images, analyzing and manipulating the images and the result in which output can be altered with related to image analysis. Sampling and quantization are the two methods involved to convert continuous data into digital form. Image resizing, Image interpretation plays a vital role in image processing. Then, Image enhancement, Image segmentation, Image Filtering plays a vital role. These paper overviews about the recent challenges in image processing.

Keywords: Image analysis, resize, segmentation, enhancement, Matlab

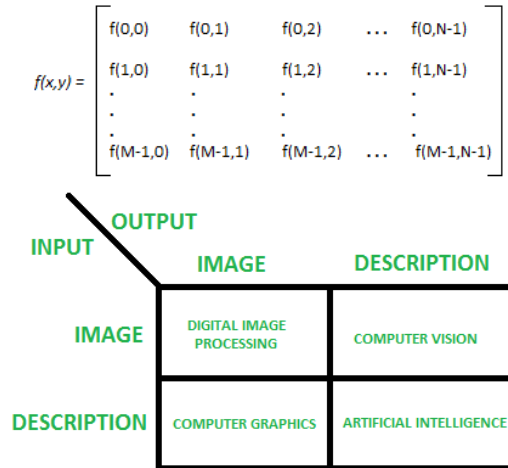
1. Introduction

Image Processing System is the combination of the different elements involved in the digital image processing. Digital image processing is the processing of an image by means of a digital computer. [1]Digital image processing uses different computer algorithms to perform image processing on the digital images. Digital image processing techniques help in manipulation of the digital images. by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction. Digital Image is composed of a finite number of elements, each of which elements have a particular value at a particular location.[1]These elements are referred to as picture elements, image elements, and pixels. A Pixel is most widely used to denote the elements of a Digital Image. It consists of the following components.



Components of image processing computer: computer used in the image processing system is the general-purpose computer that is used by us in our daily life. Image processing software: image processing software is the software that includes all the mechanisms and algorithms that are used in image processing system. Mass storage: mass storage stores the pixels of the images during the processing. Hard copy device: once the image is processed then it is stored in the hard copy device. It can be a pen drive or any external rom device. Image display: it includes the monitor or display screen that displays the processed images. Network is the connection of all the above elements of the image processing system. Types of an image: binary image– the binary image as its name suggests, contain only two pixel elements i.e. 0 & 1, where 0 refers to black and 1 refers to white. This image is also known as monochrome. Black and white image– the image which consists of only black and white color is called black and white image. 8 bit color format– It is the most famous image format. It has 256 different shades of colors in it and commonly known as Grayscale Image. In this format, 0 stands for Black, and 255 stands for white, and 127 stands for gray. 16 bitColor Format– It is a color image format. It has 65,536 different colors in it. It is also known as High Color Format. In this format the distribution of color is not as same as Grayscale image. Image as a Matrix. The right side of this equation is digital image by definition [1]. Every element of this matrix is called image element, picture element, or pixel. Phases of image processing acquisition– it could be as simple as being given an image which is in digital form. The main work involves: a) scaling b) color conversion (rgb to gray or vice-versa) image enhancement– it is

amongst the simplest and most appealing in areas of image processing it is also used to extract some hidden details from an image and is subjective. Image restoration– it also deals with appealing of an image but it is objective (restoration is based on mathematical or probabilistic model or image degradation).color image processing– it deals with pseudo color and full color image processing color models are applicable to digital image processing. Wavelets and multi- resolution processing– it is foundation of representing images in various degrees. 6. Image compression-it involves in developing some functions to perform this operation. it mainly deals with image size or resolution. 7. Morphological processing-it deals with tools for extracting image components that are useful in the representation & description of shape. 8. Segmentation procedure- it includes partitioning an image into its constituent parts or objects. Autonomous segmentation is the most difficult task in image processing. 9. Representation & description -it follows output of segmentation stage, choosing a representation is only the part of solution for transforming raw data into processed data. 10. Object detection and recognition- it is a process that assigns a label to an object based on its descriptor.



Recent challenges in Image Processing: According to block 1, if input is an image and we get out image as a output, then it is termed as Digital Image Processing. According to block 2, if input is an image and we get some kind of information or description as a output, then it is termed as ComputerVision. According to block 3, if input is some description or code and we get image as an output, then it is termed asComputer Graphics. According to block 4, if input is description or some keywords or some code and we get description or some keywords as a output,then it is termed as Artificial Intelligence.Challenges in Digital image processingthere are 5 challenges involved. They are: .Imagesegmentation.b. Image Classification.c. Multiple Aspect Ratios and Spatial Sizes.d. Removing Prints or Security like Encryption.e. Image Enhancement.

2. Segmentation

Segmentation helps in processing the only object that is required, rather than processing the whole picture. The detector can identify the requisite segments or objects using algorithms[2]. It lets the detector get off processing the whole image, which reduces inference time. The amount of time incurred on processing new data for making projections using machine learning is called inference time. Now, the problem begins to appear when it is segmented. So, this segmenting is itself a challenge. [2]For a human mind, it's not difficult because it's extraordinary and can instinctively extract object information. However, the below-mentioned techniques make it easier: Watershed Segmentation Edge-Based Segmentation Thresholding Segmentation Region-Based Segmentation Neural Networks for Segmentation Clustering-Based Segmentation Algorithm The above methods of segmentation can be refined in the later research technologies. Image ClassificationImage classification refers to associating one label or more labels to a given image. Classification is not easy. There are several roadblocks that may interfere when you classify them. [3] Assigning the label to an image can have challenges related to variations. These can be like:Scale Variation: Having images of the same object in multiple sizes is considered a scale variation.View-Point Variation: The difference in viewpoints of an image is called viewpoint variation, which can be considered as the 3-D image of a pen, chair, or anything that is seen from different angles, and looks different.Illumination: The change in the intensity level of pixels is termed illumination. The classification experts struggle to handle this variation for giving any picture of the same object with different brightness levels. Assigning labels can help in it.Object Detection: Object detection is a significant computer vision technology, which lets data scientists find and classify various instances of images. The applications like sports training, trafficanagement, and video surveillance systems require object detection. Object Localization: Classifying objects and determining where they are located is termed object localisation. The multitask loss functionproves a tool to rectify this problem. Multiple Aspect Ratios and Spatial SizesThe object may vary in size and ratio. Therefore, the detection algorithms find it tough to deal with these different scales and views.Intra-Class Variation: It's a variation between the images of the same class. It's like a number of children in a classroom.Viewpoint Variation: Shifting angles can change the way an object looks. This is indeed a tedious and daunting task for detectors to recognise objects from different angles. Occlusion: This is related to the latent or hidden part of the object. It can be illustrated as a part of the wall behind the curtain, but it can be detected and classified.Deformation: Training a detector to detect deformed objects is difficult. However, various algorithms are drawn to

spot a person or object in various situations. Then only, it is identified in contorted positions. Limited Data: A limited amount of data can be a big problem. It can put a limit on image classifications, and segmentation. Background Clutter: Having a ton of objects in the image makes it an uphill battle to find a particular object. These are clutter or noises. Observers find it tough to detect a specific object unless they have a semantic understanding of the image. 2.1.4 Removing Prints or Security like Encryption: Watermarks are meant for protecting intellectual property. [4]The high level of consistency in style is the problem, which needs to be inverted. The data scientists have to estimate that watermarked image and its opacity, and recover the original image underneath. The ML algorithms do it automatically by observing that image. [4]These experts train algorithms to recognise these publicly available patterns, and then, carry out a process known as multi-image matting. The ML makes your machine understand the object of the watermark, like gradient, shadow, structure, and opacity. But, drawing, testing, and then, deploying these algorithms as an ML is not like a walkover. Likewise, there are some challenges that interfere with encryption. These can be associated with Key Leakage: Also known as information leakage, which happens whenever your system reveals some critical information to unauthorized parties or users. Software Bugs: These are unexpected problems with software and hardware that interrupt the smooth functioning of programming functions. Holes in Operating Systems: Holes here mean the vulnerability of software or operating system that can be attempted to damage the overall security of the computer system or network. Side-Channel Attacks: These are security holes that are attempted to compromise the security of a system and steal information from the system. Phishing Attacks: It's a cyber security attack that involves malicious messages that are pretended to come from a trusted person or entity. Social Engineering: It covers a broad range of malicious practices through human interactions to break into the normal security procedures for gaining unauthorized access to systems or networks. 2.1.5 Image Enhancement This process really needs an intense focus on important features of an image. It is all because the image requires more brightness, or clear elements to appear as in X-ray films. [5]In aerial photos, the edges or lines require sharpening for a crystal clear view of buildings or other objects. The pictures captured from telescopes and space probes can also be required to be enhanced. Here, deep learning and computer vision can help in image recognition & then in its enhancement. The patterns are driven by the most commonly encountered challenges and cases. [6]These patterns are then tested and proved to be effective. Then, it creates a neural architecture or network, which discovers the "how image recognition takes place recognition and computer vision. This phase is extremely difficult to come across. It involves the image processing problem statement in recognition & seeing them through the computer vision." using image Recognition: It is concerned with identifying images and grouping them in several predefined classes. A deep learning-based application can easily discover elements from the classes. Computer Vision: It aims at enabling machines [8] to carry out tasks, like image classifications, segmentation, localisation, and detection.

3. Conclusion

The challenges listed above are allowed efficiently to improve the techniques of image processing. Image enhancement is relatively difficult to perform but the recognition and computer vision can do vast improvements in the method of enhancement [9]. Even these above techniques can be used for the technology of Artificial Intelligence to act as an emerging trend.

4. Future Enhancement

The challenges can be reformed in the future to overcome the difficulties already processed in existing system. The proposed system should prove the development with Hundred Percent accuracy. Finally, new data and algorithms are encouraged to move to the next step of image processing.

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