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1. Find toolbox Matlab for reading and show image
2. Find toolbox for convert RGB to grayscale
3. Learn about created image processing, digitalization image processing, and kind of image format. Explain!
4. Find information about image, ex: brightness, texture, and others

Answer:

1. In matlab using `hddread` for import picture from file to project. This function use for HDR image. And show it using `imshow`. For example:

Result:

Function `tonemap` used for convert HDR image to dynamic range that can be view in computer. Convert HDR image to unit8 class RGB image

2. In matlab using `rgb2gray` for convert RGB image to grayscale image. This function eliminate the hue and saturation while retaining the luminance. For example:

Result:

https://www.mathworks.com/help/matlab/ref/rgb2gray.html

3. Image Processing :

- That contains 5 fundamental purpose :
  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.
- Digital Image Processing :

1. **Image Acquisition**

This is the first step or process of the fundamental steps of digital image processing. Image acquisition could be as simple as being given an image that is already in digital form. Generally, the image acquisition stage involves preprocessing, such as scaling etc.

2. **Image Enhancement**

   Image enhancement is among the simplest and most appealing areas of digital image processing. Basically, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image. Such as, changing brightness & contrast etc.

3. **Image Restoration**

   Image restoration is an area that also deals with improving the appearance of an image. However, unlike enhancement, which is subjective, image restoration is objective, in the sense that restoration techniques tend to be based on mathematical or probabilistic models of image degradation.

4. **Color Image Processing**

   Color image processing is an area that has been gaining its importance because of the significant increase in the use of digital images over the Internet. This may include color modeling and processing in a digital domain etc.

5. **Wavelets and Multiresolution Processing**

   Wavelets are the foundation for representing images in various degrees of resolution. Images subdivision successively into smaller regions for data compression and for pyramidal representation.

6. **Compression**

   Compression deals with techniques for reducing the storage required to save an image or the bandwidth to transmit it. Particularly in the uses of internet it is very much necessary to compress data.

7. **Morphological Processing**

   Morphological processing deals with tools for extracting image components that are useful in the representation and description of shape.

8. **Segmentation**

   Segmentation procedures partition an image into its constituent parts or objects. In general, autonomous segmentation is one of the most difficult tasks in digital image processing. A rugged segmentation procedure brings the process a long way toward successful solution of imaging problems that require objects to be identified individually.

9. **Representation and Description**

   Representation and description almost always follow the output of a segmentation stage, which usually is raw pixel data, constituting either the boundary of a region or all the points in the region itself. Choosing a representation is only part of the solution for transforming raw data into a form suitable for subsequent computer processing. Description deals with extracting attributes that result in some

quantitative information of interest or are basic for differentiating one class of objects from another.

10. Object recognition

Recognition is the process that assigns a label, such as, “vehicle” to an object based on its descriptors.

11. Knowledge Base:

Knowledge may be as simple as detailing regions of an image where the information of interest is known to be located, thus limiting the search that has to be conducted in seeking that information. The knowledge base also can be quite complex, such as an interrelated list of all major possible defects in a materials inspection problem or an image database containing high-resolution satellite images of a region in connection with change-detection applications.

Image format :

1. TIFF (also known as TIF), file types ending in .tif

TIFF stands for Tagged Image File Format. TIFF images create very large file sizes. TIFF images are uncompressed and thus contain a lot of detailed image data (which is why the files are so big) TIFFs are also extremely flexible in terms of color (they can be grayscale, or CMYK for print, or RGB for web) and content (layers, image tags).

2. JPEG (also known as JPG), file types ending in .jpg

JPEG stands for Joint Photographic Experts Group, which created this standard for this type of image formatting. JPEG files are images that have been compressed to store a lot of information in a small-size file. Most digital cameras store photos in JPEG format, because then you can take more photos on one camera card than you can with other formats.

3. GIF, file types ending in .gif

GIF stands for Graphic Interchange Format. This format compresses images but, as different from JPEG, the compression is lossless (no detail is lost in the compression, but the file can’t be made as small as a JPEG).

GIFs also have an extremely limited color range suitable for the web but not for printing. This format is never used for photography, because of the limited number of colors. GIFs can also be used for animations.

4. PNG, file types ending in .png

PNG stands for Portable Network Graphics. It was created as an open format to replace GIF, because the patent for GIF was owned by one company and nobody else wanted to pay licensing fees. It also allows for a full range of color and better compression.

5. Raw image files

Raw image files contain data from a digital camera (usually). The files are called raw because they haven’t been processed and therefore can’t be edited or printed yet. There are a lot of different raw formats–each camera company often has its own proprietary format.

Reff:

https://www.ques10.com/p/33595/what-is-image-processing-explain-fundamental-steps/

ivanexpert.com/blog/2010/05/the-5-types-of-digital-image-files-tiff-jpeg-gif-png-and-raw-image-files-and-when-to-use-each-one/

4. A. Brightness = information of image that conduct the intensity of light in image. Isn't the real intensity of image but average of the intensity of light in entire image

   B. Contrast = information of image that declare of light and dark distribution in image. Good image have good dark and light composition.

   C. Contour= Contour is a state caused by changes in the intensity of neighboring pixels. Because of this change in intensity our eyes are able to detect the edges of objects in the image.

   D. Color = Color is the perception perceived by the human visual system of the wavelength of light reflected by an object. Each color has a different wavelength (l). The red color has the highest wavelength, while the purple color (violet) has the lowest wavelength.

   E. Shape = Shape is an intrinsic property of a three-dimensional object, with the understanding that shape is the main intrinsic property for the human visual system. Humans more often associate objects with their shapes than other elements (colors for example). In general, images formed by the eyes are (2-dimensional), whereas the objects seen are generally three-dimensional (3-dimensional). Object shape information can be extracted from the image at the beginning of pre-processing and image segmentation. One of the main challenges in computer vision is representing forms, or important aspects of forms.

   F. Texture = Texture is characterized as a spatial distribution of gray degrees in a set of neighboring pixels [JAI95]. So, texture cannot be defined for a pixel. The human visual system essentially does not receive image information independently at each pixel, but rather an image is considered as a whole.

   (Reff = Munir, Pengolahan Citra Digital)