زبان تخصصی مهندسی کامپیوتر

درس هفتم:

Tips and Tricks for Producing Digital Images

Part I- Writing Development: Cause and effect

- در درس قبل، رابطه سبب و اثر ، و بکارگیری آن برای توسعه پاراگراف معرفی شد. در این درس به ساختار دیگری از رابطه سبب و اثر در نوشتن جمله میپردازیم.

Clause structures: The statement includes signals whose parts are separated using: so…….that, such……that, and such a/an…….that.

So + adjective/adverb + that **such + (adjective) + NOUN + that**

I was **so** sleepy **that** I couldn't keep my eyes open.

It was **so** windy **that** we couldn't go sailing.

It was **such** a great movie **that** I've watched it several times.

It was **such** a cold afternoon **that** we stopped playing.

- Phrase structures: A phrase (a group of words) is a complete sentence, so it must be connected to a complete sentence.

Because of **Due to** **As a result of** **In view of**	**the accuracy of process, the image restoration was so effective.**

- **Predicate structures:** Everything that comes after a verb in a sentence is called a predicate. In the following table, the cause and effect relationship is shown by the verb or the words coming after it.

The accuracy of process will	**cause** **lead to** **result in** **be the reason for** **be responsible for** **contribute to**	**effective image restoration.**

Part II-Vocabulary

Distinguish (v) **تمیز دادن، فرق قائل شدن**

- Recognize or treat (someone or something) as different: the child is perfectly capable of distinguishing reality from fantasy.

Autonomous (adj) **مستقل، خودگران**

- (Of a country or region) having self-government, at least to a significant degree: the federation included sixteen autonomous republics.
- acting independently or having the freedom to do so: an autonomous committee of the school board.

Boundary (n) **مرز**

- A line that marks the limits of an area: a boundary wall.

Accomplish (v) انجام دادن

- Achieve or complete successfully: the planes accomplished their mission.

Infer (v) **حدس زدن، استنتاج کردن**

- Deduce or conclude (information) from evidence and reasoning rather than from explicit statements: *from these facts we can infer that crime has been increasing.*

Reverse (n) **برعکس ، در جهت عکس**

- Move backward: the truck reversed into the back of a bus.

Surveillance (n) **نظارت چشمی ، سرپرستی**

- the act of carefully watching someone or something especially in order to prevent or detect a crime*: he found himself put **under surveillance** by military intelligence.*

Consecutive (adj) **متوالی**

- Following continuously*: five consecutive months of serious decline.*

Part III– Reading

DIGITAL IMAGE

Section 1: Pre-reading Questions

- What comes into your mind when looking at digital images?
- What are the processes for producing digital images in a computer?
- How do you connect video tracking to digital images? Discuss and provide your reasons.

Section 2: Reading Passage

Human beings can make sense of the world through processing their visual data. For instance, they easily distinguish a face, differentiate different colors and process images instantly. Image processing involves changing the nature of an image to either improve its pictorial information for human interpretation, or render it more appropriately for autonomous machine perception. Before a computer processes an image, the image is converted into a digital form. Digitization includes sampling an image and the quantization of sampled values. After converting the image into bits of information, digital image processing can be started.

حس کردن - ارائه کردن ، تقدیم کردن - رقمی سازی، مقدار دهی

Digital image processing involves using a computer to change the presentation of a digital image for different aspects. In digital representation, the image is considered as a two dimensional array, *a*(x,y) with an *a* as the amplitude (e.g. brightness) of the image at the real coordinate position (x,y). The processing techniques may include image enhancement, image restoration, image compression, and so on.

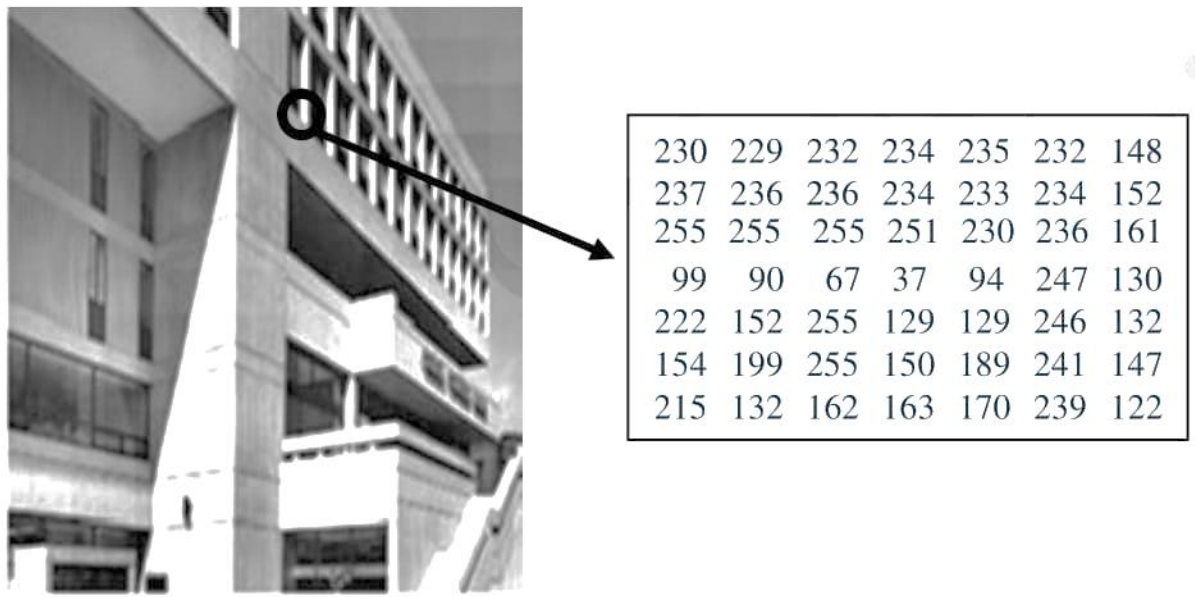
Image enhancement refers to accentuation, or sharpening image features such as boundaries, illumination, or contrast to make a graphic display more useful for displaying and analysis. This process does not increase the inherent content information in data. Image restoration is concerned with filtering the observed image to minimize the effect of degradations. Effectiveness of image restoration depends on the extent and accuracy of the knowledge degradation process on filter design. Image restoration differs from image enhancement in that the latter is concerned with more extraction or accentuation of image features. Image compression is concerned with minimizing the number of bits required to represent an image. Applications of compression include TV and facsimile transmission.

جنبه، منظر - ترمیم، بازسازی - تاکید، تشدید - روشنایی - ذاتی

1. Digital image processing

A digital image can be considered as a large array of discrete dots, each of which has a brightness associated with it. These dots are called picture elements, or simply pixels, as depicted in Figure 1. For example, when we take a picture (image) with a digital camera in the black and white mode, the image seems black and white (that is, lots of shades of grey). We may consider this picture as a two dimensional function, where the function values give the brightness of the image at any given point shown in Figure 1. We may assume that brightness values in this image are integer numbers range from 0 (for black) to 255 (for white).

مربوط به - نشان دادن - خاکستری



230	229	232	234	235	232	148
237	236	236	234	233	234	152
255	255	255	251	230	236	161
99	90	67	37	94	247	130
222	152	255	129	129	246	132
154	199	255	150	189	241	147
215	132	162	163	170	239	122

Figure 1: A grayscale image.

A lot of research has focused on image processing techniques; however, few of them, which can easily be implemented, are described here. An image threshold is the simplest image processing technique. In this technique, pixel values higher or lower than a threshold are either suppressed or changed to a predefined value. For instance, you have a document containing a text and a picture, with background colour, and you want to recognize the text via an OCR, stands for Optical Character Recognition. The OCR system first needs to scan the document into an image file. Then, the system employs an image processing technique to remove the picture and the background colour. This is normally accomplished via the thresholding technique.

ملغی کردن، سرپوش گذاشتن

If the brightness of a digital image is low, you may enhance the image by increasing its pixel number values. In contrast, if an image is too bright, you can improve it via decreasing its pixel number values. Image histogram is a valuable tool to assist the general brightness of a digital image. Histogram is a graph representing the distribution of grey values in an image. In other words, a histogram indicates the number of times each grey level occurs in the image. We can infer a great deal about the appearance of an image from its histogram. In a dark image, the grey levels (and hence the histogram) would be clustered at the lower end. In a uniformly bright image, the grey levels would be clustered at the upper end. In a well-contrasted image, the grey levels would be well spread out over much of the range. Generally, by spreading out its histogram via the image processing technique mentioned above, a poorly contrasted image can be enhanced.

هیستوگرام، نمودار ستونی – دسته شدن، جمع شدن

Due to technical limitations, many imaging devices may not display the actual appearance of objects. This technical limitation, known as gamma distortion, often disturbs an image. In gamma distortion, the pixel value is changed via a mathematical power operation, i.e. $f(x,y)$ is changed to $g(x,y) = f^{\gamma}(x,y)$. To enhance an image suffering from gamma distortion, pixels of the image can be recovered by the reversed power operation, $f(x,y) = g^{1/\gamma}(x,y)$. The image represented in Figure 2 was enhanced via the gamma correction method and the result is displayed there. This figure indicates that gamma correction technique, despite being simple in implementation, is a very powerful image enhancing technique.

به هم زدن، آشفته کردن - متحمل شدن - علی‌رغم ، با وجود

Figure 2 : Result of gamma correction method

(left: original, right: enhanced).

2. Video tracking

With the advances in the digital image processing techniques and computational power of modern computers, many new applications have emerged for image processing. Video tracking is one of such applications. Digital video comprises a series of digital images displayed in a rapid succession at a constant rate. In video context, these images are called frames. Video tracking is the process of locating a moving object (or multiple objects) over time using a camera. It has a variety of applications, some of which are: human-computer interaction, security and surveillance, video communication and compression, and traffic control. Video tracking can be a time consuming process due to the number of frames existing in a video film.

پدیدار شدن - تشکیل شدن - سریع - زمان بر

Video tracking concerns with associating target objects in consecutive video frames. The association can be especially difficult when the objects move fast relative to the frame rate. Another situation that increases the complexity of the problem is when the tracked object changes orientation over time. For these situations, video tracking systems usually employ a motion model, which describes how the image of the target might change for different possible motions of an object. To perform video tracking, an algorithm analyzes sequential video frames and outputs the movement of targets between the frames. There are two major components in a video tracking system: first target representation and localization, and second filtering and data association.

مربوط بودن

Part IV- Reading comprehension

Mark each statement as T (True), F (False), or NG (Not Given) to the information in the reading comprehension passage.

1. Visual aids help human beings understand the world better.
2. Image restoration depends on filtering the observed image to decrease the degradation.
3. OCR system helps produce good digital image in a computer.
4. The quality of digital image can be improved by increasing its pixel values.
5. The purpose of a histogram is to show how much an image occupies the space.
6. The reversed power operation improves pixels in an image suffering from distortion.
7. Digital videos include a series of digital images in a fixed rate.
8. Target representation, filtering and data association are parts of digital image.