2012

1

1. Why we cannot Inverse Filtering when the image has noise？Please explain the principle of Inverse Filtering, and then give the correct solving method.

DIP 5 P57

1. What is the Image Histograms? We say that Image Histograms is very useful, please give some examples(at least 3) to show its usefulness

The histogram of a digital image with gray levels from 0 to L-1 is a function

DIP2 P39

Examples

Histogram equalization

Histogram specification

Image segmentation based on threshold

1. Which are the three basic redundancies that can be identified in digital images？Please give the methods that can reduce or eliminate these redundancies， respectively
2. coding redundancy

Huffman coding , arithmetic coding

1. inter pixel redundancy LZW coding Run-length coding
2. psychovisual redundancy IGS coding

2

1)

An image with 16 gray levels is given as bellowing. Please give the results by using 3\*3 averaging filter and median filter, respectively.

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| --- | --- | --- | --- | --- |
| 1 | 2 | 2 | 2 | 3 |
| 1 | 15 | 1 | 2 | 2 |
| 2 | 1 | 2 | 0 | 5 |
| 0 | 2 | 2 | 3 | 1 |
| 3 | 2 | 0 | 2 | 2 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | 2 | 2 | 2 | 3 |
| 1 | 3 | 3 | . | 2 |
| 2 | . |  |  | 5 |
| 0 |  |  |  | 1 |
| 3 | 2 | 0 | 2 | 2 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | 2 | 2 | 2 | 3 |
| 1 |  |  |  | 2 |
| 2 |  |  |  | 5 |
| 0 |  |  |  | 1 |
| 3 | 2 | 0 | 2 | 2 |

2) What are the definitions of hue, saturation and intensity in HSI color model? Please draw a circular color planes to illustrate each components

Hue: IT is related with the wavelength of light。 It represents people's sensory perception of different colors, such as red, green, blue, etc., and it can also represent a certain range of colors, such as warm colors, cool colors, etc.

Saturation S (Saturation) : it means the color of purity, pure spectrum is fully saturated color, add the white light would dilute Saturation. The greater the saturation, the brighter the color will look, and vice versa.

Intensity I (Intensity), which corresponds to the Intensity of the image and the Intensity of the image, is the Intensity of the color. DIP10 P30

3) Given a binary image as below, please use 8-directional chain code to representation it(S is the start point) then **normalize** the chain code with respect to the starting point DIP12 P10

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1(S) | 1 |  |  |  |  |  |
| 1 |  | 1 | 1 | 1 | 1 | 1 |
| 1 |  |  |  |  |  | 1 |
| 1 | 1 |  |  |  | 1 |  |
|  |  | 1 | 1 |  | 1 |  |
|  |  |  |  | 1 |  |  |

0 7 0 0 0 065653434222

0 0 0 0656534342220 7

3

Consider an image with 4gray levels, z0=0,z1=1,z2=2,z3=3.

Define a position operator as ”one pixel to the right and one pixel below ”,please calculate its Gray Level Co-occurrence Matrix

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| --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 0 | 1 | 2 |
| 1 | 2 | 3 | 0 | 1 | 2 | 3 |
| 2 | 3 | 0 | 1 | 2 | 3 | 0 |
| 3 | 0 | 1 | 2 | 3 | 0 | 1 |
| 0 | 1 | 2 | 3 | 0 | 1 | 2 |
| 1 | 2 | 3 | 0 | 1 | 2 | 3 |
| 2 | 3 | 0 | 1 | 2 | 3 | 0 |

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4

Illustrate the principle of Hough Transform, and give the calculating steps of Hough Transform for line detection

The basic principle of Hough transform is to change the given curve of the original image space into a point of the parameter space by using the duality of point and line.In this way, the detection problem of the given curve in the original image is transformed into the problem of finding the peak value in the parameter space.In other words, the whole characteristic of detection is transformed into the local characteristic of detection

第二问在DIP9 P11

5

Binary image X and structuring element B are given as follows

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1. 用B来erosion(腐蚀)A
2. 用B来膨胀A

膨胀时结构元素需要旋转180，腐蚀时不用

2013

1. Hough Transform
2. Compression ratio&& redundancy（run length coding）
3. List 3 typical color models and explain each component briefly

RGB

CMY

HIS

H：IT is related with the wavelength of light

1. Average filter median filter laplacian filter computation histogram
2. What is inverse filtering？ Give image restoration models
3. Chain code and normalization
4. 腐蚀和膨胀
5. 算术编码
6. Steps for estimating noise parameters
7. Color models
8. Co-occurrence matrix

2014

1

1. Describe the difference and similarity between Roberts Cross-Gradient Operators and Laplacian Operators

8页的资料里，第四页下方

1. What is the Gamma Correction? Give the brief steps of Gamma Correction

8页的资料里，第5页

2

1. what are the basic quantities to describe the quality of a light source ? Why can people see an object in color Dip1
2. what is Image enhancement? What is Image Restoration? What are the differences between them?
3. (a)Convert it into a binary image by using the right function

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 3 | 2 | 1 | | 3 | | 2 | 1 |
| 0 | 5 | 7 | 6 | 2 | | 5 | | 7 | 6 |
| 1 | 6 | 0 | 6 | 1 | | 6 | | 3 | 1 |
| 2 | 6 | 7 | 5 | 3 | | 5 | | 6 | 5 |
| 3 | 2 | 2 | 7 | 2 | | 6 | | 1 | 6 |
| 2 | 6 | 5 | 0 | 2 | | 3 | | 5 | 2 |
| 1 | 2 | 3 | 2 | 1 | | 2 | | 4 | 2 |
| 3 | 1 | 2 | 3 | 1 | | 2 | | 0 | 1 |
|  |  |  |  | |  | |  | |  |  |
|  | 1 | 1 | 1 | |  | | 1 | | 1 | 1 |
|  | 1 |  | 1 | |  | | 1 | |  |  |
|  | 1 | 1 | 1 | |  | | 1 | | 1 | 1 |
|  |  |  | 1 | |  | | 1 | |  | 1 |
|  | 1 | 1 |  | |  | |  | | 1 |  |
|  |  |  |  | |  | |  | |  |  |
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1. Calculate the binary image’s Euler formula

8页的资料里 第八页

3Segment the following image by region growing method. The seed points is given in the shadow, and growing criteria is the gray level difference <T. Please give the segmentation result when T is 3 and separately DIP9 P59

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 11 | 10 | 14 | 17 | 15 |
| 11 | 10 | 14 | 17 | 15 |
| 10 | 11 | 15 | 15 | 15 |
| 12 | 10 | 15 | 16 | 15 |
| 12 | 12 | 15 | 16 | 14 |

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4 consider the 8\*8 image below,8gray levels, assume we use 3-bits to store all integer values:

1. apply run length coding on the image
2. compete the compression ratio

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| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 5 | 6 | 6 | 6 | 5 | 6 | 5 | 6 |
| 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |

5 DIP2 P56

1. Please draw its histogram
2. Do the Histogram Equalization and give the detail process
3. Draw the histogram after the Equalization

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 2 | 2 | 3 | 3 | 4 | 5 |
| 4 | 4 | 0 | 5 | 5 | 5 | 6 | 6 |
| 5 | 5 | 5 | 5 | 7 | 2 | 2 | 1 |
| 5 | 6 | 6 | 6 | 0 | 0 | 2 | 2 |
| 4 | 2 | 2 | 2 | 0 | 0 | 0 | 0 |
| 6 | 7 | 5 | 5 | 2 | 1 | 2 | 1 |
| 5 | 4 | 3 | 4 | 5 | 0 | 0 | 0 |
| 5 | 5 | 5 | 4 | 4 | 4 | 2 | 2 |

6

1. What are the main applications od Erosion and Dilation, separately?

Dilation：repair breaks, repair intrusions

Erosion split apart joined objects, strip away wxtrusions

1. An image I and a structure element B are given as below. Please give the result of the follow
2. Ersion
3. Dilation

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B

2015

1

1. what’s lossy &lossyless mean in the image compression

八页的资料里第二页

1. what is the difference between low-pass filter and high-pass filter

八页的资料里第6页

1. Please give the steps of Canny edges Detection
2. what is Image enhancement? What is Image Restoration? What are the differences between them? Dip5

Image enhancement: selectively highlight of useful information for a specific application by a technology, weaken or suppress some useless information.

Image enhancement is primarily a subjective process, and the image restoration is mainly an objective process; image enhancement without considering how the image is degraded, and image restoration need to know a priori knowledge of image degradation mechanisms and procedures, etc.

八页的资料里第3页

1. What are the primary colors, and what are the secondary colors? Can you list 3typical color models and explain its applications?

2

1. Give the result by the 3\*3 average filter
2. Do the image enhancement by laplacian filter

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 3 | 7 | 6 | 2 | 0 |
| 2 | 4 | 6 | 1 | 1 |
| 4 | 7 | 2 | 5 | 4 |
| 3 | 0 | 6 | 2 | 1 |
| 5 | 7 | 5 | 1 | 2 |

Laplacian 算子

|  |  |  |
| --- | --- | --- |
| 0 | -1 | 0 |
| -1 | -4 | -1 |
| 0 | -1 | 0 |

3同14年2（3）

4

1. its 8directional chain code

07775443312

(b)normalized chain code with respect to the staring point07775443312

(c)the first difference of the chain code

67006707061

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 |

5

1. What are the main applications od Erosion and Dilation,separately?
2. An image I and a structure element B are given as below. Please give the result of the follow
3. Ersion
4. Dilation

|  |  |  |  |  |  |  |  |
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6give a string “SHENZHENNS”

1. encode the set by Huffman coding,give the detail process of each coding step
2. calculate the average length of the coding .Comparing with the fixed length coding method. Calculate the compression and the code redundancy
3. decoding the code string:001011101001111000010001111010

2018

Question One：

1.Median filter & characterisitcs.

2.Difference between lossess compression and lossy compression;at least 2 typical methods of them.

3.Image enhancement and image restoration difference.

4.Main purposes of image smoothing and sharpening.

5.Which color model is more closer to human vision system ?why?

Question Two:

Robert operators.

Question Three:

Euler number.

Question Four:

MAT skeleton extraction.

Question Five:

Image histogram equalization.

Question Six:

Erosion and dilation applications.

Closing operation.

Question Seven:

Run-length coding.

Huffman coding.

Hybird coding.