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FACULTY OF EGINEERING

Digital Image Processing
LECTURE-14

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OUTLINE

- Power Law Transformation
- Contrast Stretching
- Bit-Plane Slicing
- Histogram Processing
- MCQ
- References

Power Law Transformation

$s = cr^{\gamma}$

C, γ : positive constants

Gamma correction

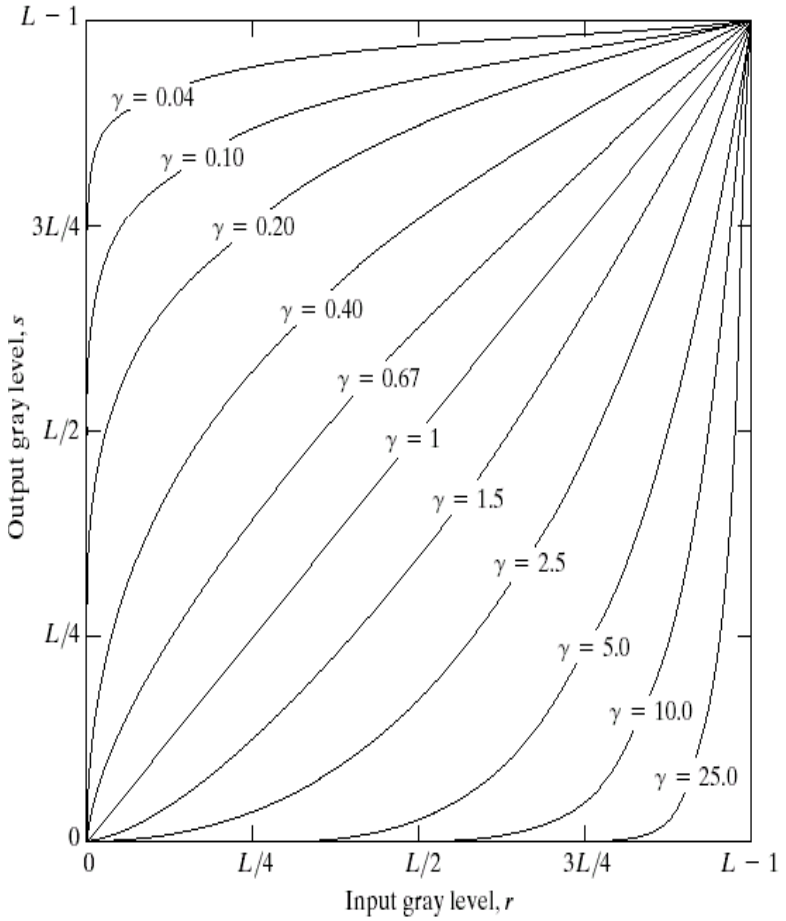
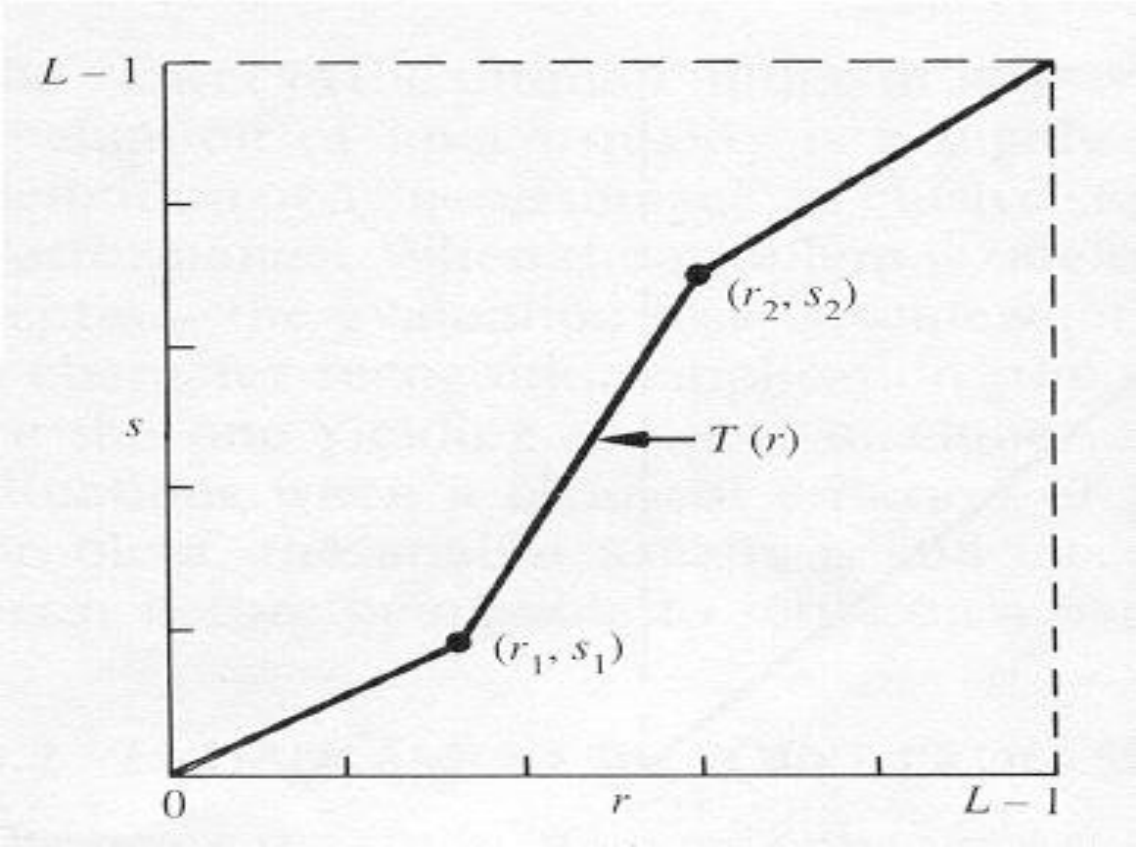


FIGURE 3.6 Plots of the equation $s = cr^{\gamma}$ for various values of γ ($c = 1$ in all cases).

Contrast Stretching

To increase the dynamic range of the gray levels in the image being processed.



Contrast Stretching

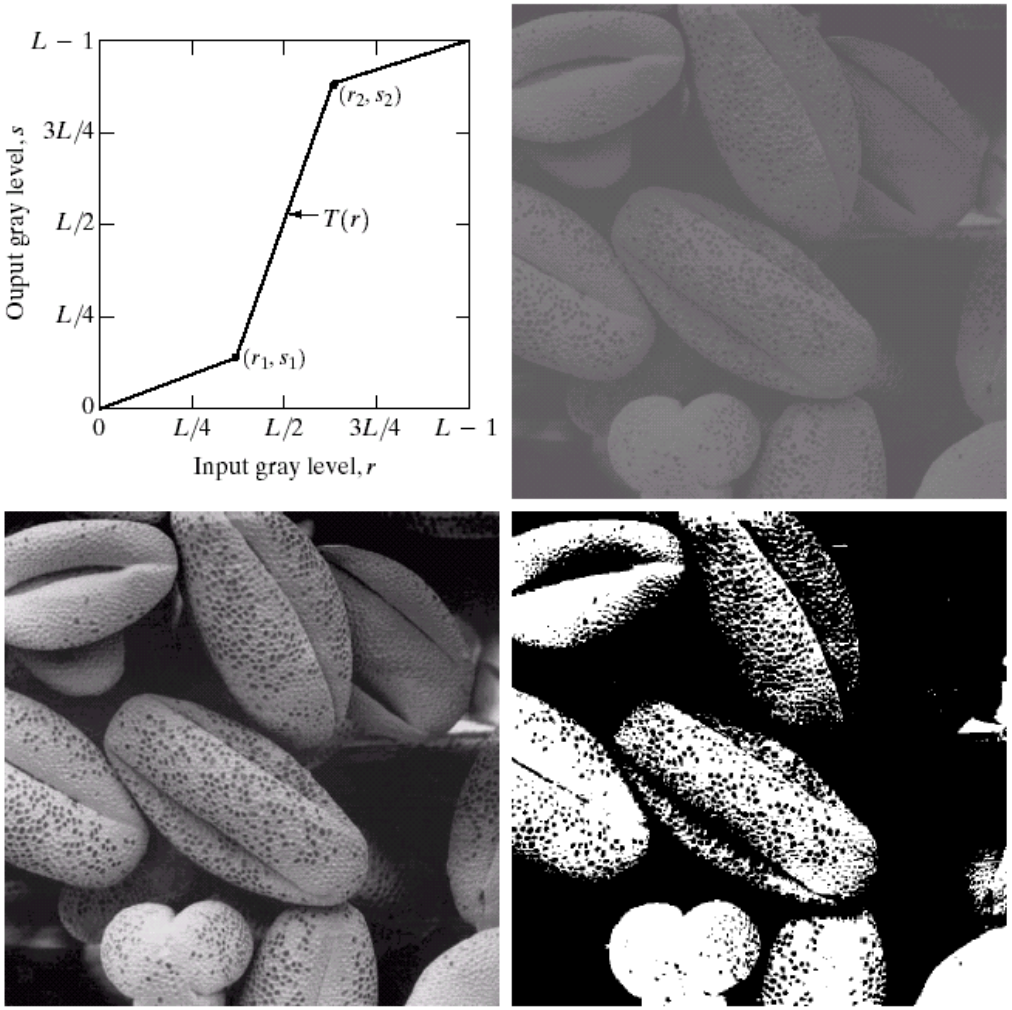
The locations of (r1,s1) and (r2,s2) control the shape of the transformation function.

- If r1= s1 and r2= s2 the transformation is a linear function and produces no changes.
- If r1=r2, s1=0 and s2=L-1, the transformation becomes a thresholding function that creates a binary image.

•Intermediate values of (r1,s1) and (r2,s2) produce various degrees of spread in the gray levels of the output image, thus affecting its contrast.

•Generally, r1≤r2 and s1≤s2 is assumed.

Contrast Stretching



a b
c d

FIGURE 3.10 Contrast stretching. (a) Form of transformation function. (b) A low-contrast image. (c) Result of contrast stretching. (d) Result of thresholding. (Original image courtesy of Dr. Roger Heady, Research School of Biological Sciences, Australian National University, Canberra, Australia.)

Bit-Plane Slicing

To highlight the contribution made to the total image appearance by specific bits.

•i.e. Assuming that each pixel is represented by 8 bits, the image is composed of 8 1-bit planes.

•Plane 0 contains the least significant bit and plane 7 contains the most significant bit.

•Only the higher order bits (top four) contain visually significant data. The other bit planes contribute the more subtle details.

Bit-Plane Slicing

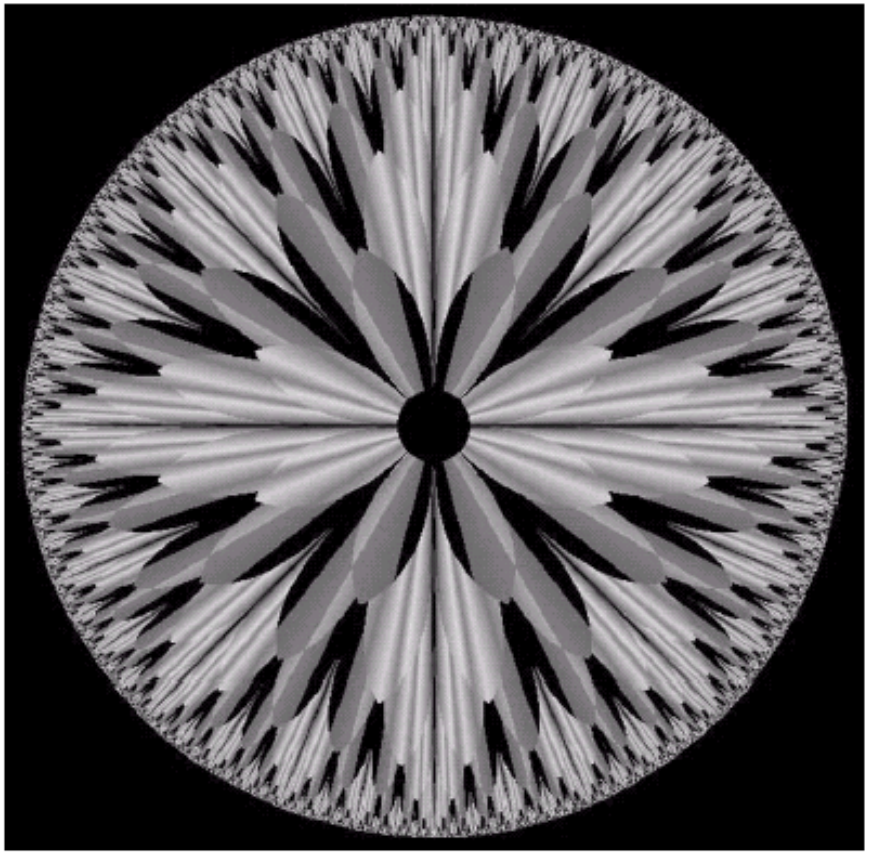


FIGURE 3.13 An 8-bit fractal image. (A fractal is an image generated from mathematical expressions). (Courtesy of Ms. Melissa D. Binde, Swarthmore College, Swarthmore, PA.)

Bit-Plane Slicing

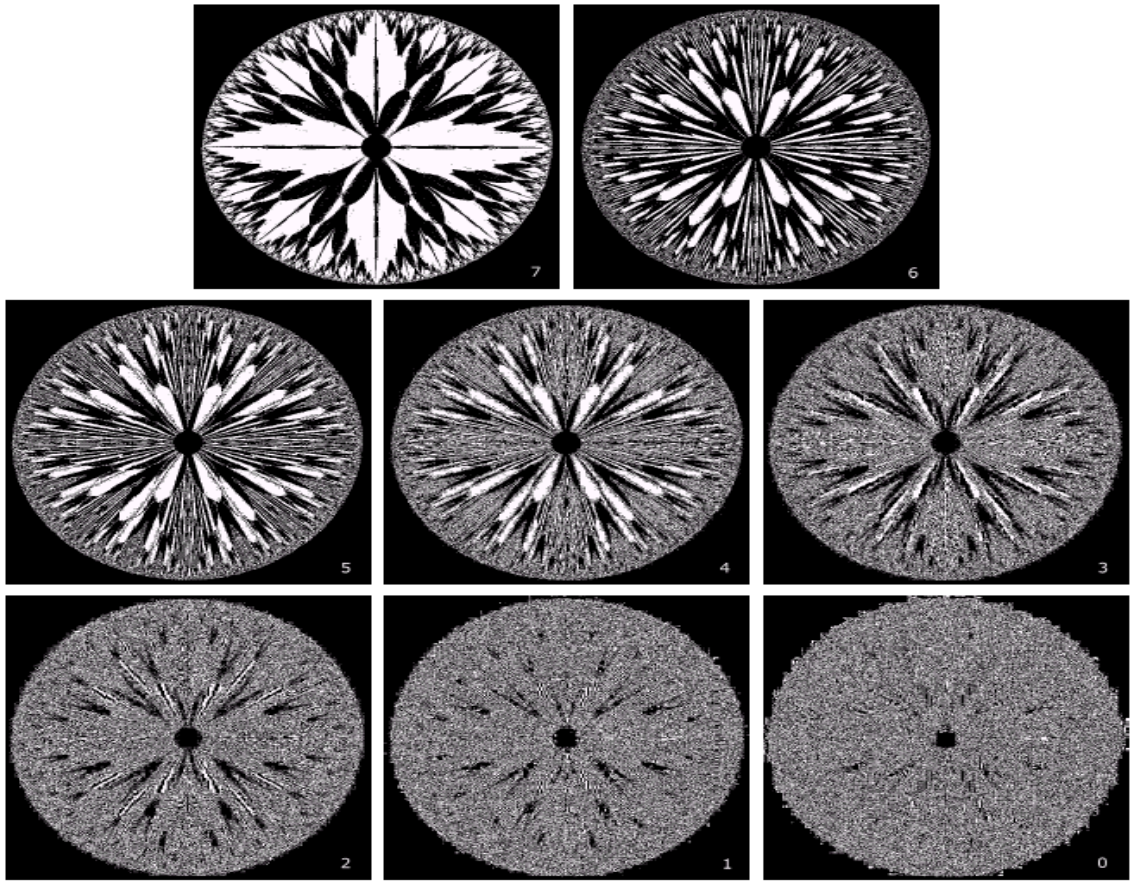


FIGURE 3.14 The eight bit planes of the image in Fig. 3.13. The number at the bottom, right of each image identifies the bit plane.

MCQ

1. Smoothing spatial filters doesn’t smooth the false contours.

   a) True

   b) False

2. The mask shown in the figure below belongs to which type of filter?

   a) Sharpening spatial filter

   b) Median filter

   c) Sharpening frequency filter

   d) Smoothing spatial filter

3. The mask shown in the figure below belongs to which type of filter?

   a) Sharpening spatial filter

   b) Median filter

   c) Smoothing spatial filter

   d) Sharpening frequency filter

MCQ

4.Box filter is a type of smoothing filter.

a) True

b) False

5. If the size of the averaging filter used to smooth the original image to first image is 9, then what would be the size of the averaging filter used in smoothing the same original picture to second in second image?

a) 3

b) 5

c) 9

d) 15

References

- https://www.javatpoint.com/digital-image-processing-tutorial
- https://www.geeksforgeeks.org/
- Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
- Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: JohnWiley and Sons, NY.
- Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall,Upper Saddle River, NJ.