

2.5 A CCD camera chip of dimensions 7×7 mm, and having 1024×1024 elements, is focused on a square, flat area, located 0.5 m away. How many line pairs per mm will this camera be able to resolve? The camera is equipped with a 35-mm lens. (Hint: Model the imaging process as in Fig 2.3, with the focal length of the camera lens substituting for the focal length of the eye.)

2.9 A common measure of transmission for digital data is the baud rate, defined as the number of bits transmitted per second. Generally, transmission is accomplished in packets consisting of a start bit, a byte (8 bits) of information, and a stop bit. Using these facts, answer the following:

a) How many minutes would it take to transmit a 1024×1024 image with 256 intensity levels using a 56K baud modem?

b) What would the time be at 3000K baud, a representative medium speed of a phone DSL (Digital Subscriber Line) connections?

2.15 Consider the image segment shown.

	3	1	2	1	(q)
	2	2	0	2	
	1	2	1	1	
(p)	1	0	1	2	

(a) Let $V = \{0,1\}$ and compute the lengths of the shortest 4-, 8-, and m -path between p and q . If a particular path does not exist between these two points, explain why.

(b) Repeat for $V = \{1,2\}$.

2.19 The median, ξ , of a set of numbers is such that half the values in the set are below ξ and the other half are above it. For example, the median of the set of values $\{2,3,8,20,21,25,31\}$ is 20. Show that an operator that computes the median of a subimage area, S , is nonlinear.

2.25 Prove that the Fourier kernels in Eqs. (2.6-34) and (2.6-35) are separable and symmetric.