HELP TO SOME OF THE QUESTIONS (1)

1 Image Enhancement

(e) How do probabilities transform?

As in histogram specification (matching):

$$\int_0^y q(y')\,dy' = \int_0^x p(x')\,dx' \quad \text{✳}$$

→ see also One of the Exams in 2008/2009: 1 (d) discussed in the class!

- x = Fourier amplitude
- y = Fourier power spectrum
- We know that $p(x) = \frac{x}{\sigma^2} e^{-x^2/2\sigma^2}$
- We know that $x = \sqrt{y}$

(the Fourier phase is irrelevant here :-)

- How do we find $q(y)$?
- Take the derivative of ✳ (see p. 1) with respect to y:

$$q(y) = p(x)\Big|_{x=\sqrt{y}} \cdot \frac{dx}{dy}$$

- $$p(x)\Big|_{x=\sqrt{y}} = \frac{\sqrt{y}}{\sigma^2}\, e^{-y/2\sigma^2}$$

- $$\frac{dx}{dy} = \frac{1}{2}\frac{1}{\sqrt{y}}$$

$$\rightarrow q(y) = \frac{1}{(2\sigma^2)}\, e^{-y/(2\sigma^2)}$$

Exponential noise! .....

- Can you guess where $p(x)$ comes from?
- And where does the uniform probability distribution of the Fourier phase come from?
- So now you know the logic behind this problem!

2 Miscellanea

(a)
(b)
} Didn't we discuss these points in the class?!

OK, let us discuss them again.....