

EECS101 Discussion 2

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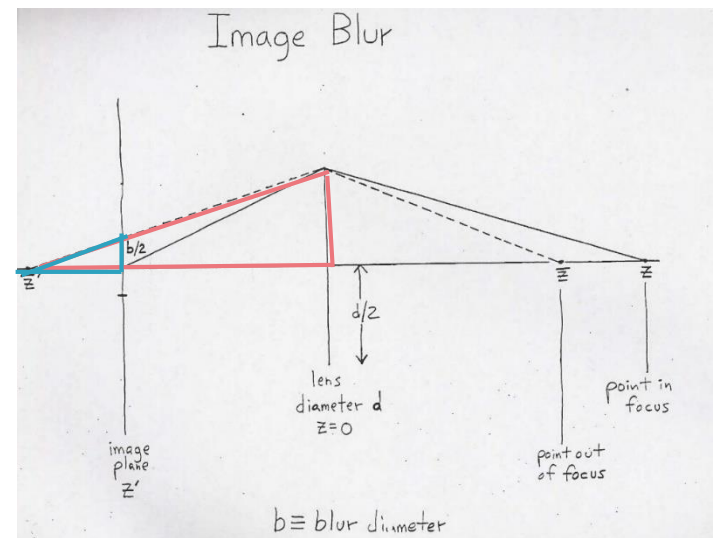
Class review

► Lens equation

- $\frac{1}{z'} + \frac{1}{-z} = \frac{1}{f}$
- z : object position, has negative value
- z' : image distance, has positive value
- f : focal length, has positive value

► Image blur (Similar triangles)

- $\frac{b}{d} = \frac{|\bar{z}' - z'|}{\bar{z}'}$
 - b : blur diameter
 - d : lens diameter
 - z' : image plane
 - \bar{z}' : image distance to have a perfect image



Class review

► Noise for CCD

$$N_{total} = N_A + N_P + N_{DC}$$

► Facts to use

- the noise components are independent
- $Var(N_P) = Mean(S + N_P)$

- $Var(X) = mean(X^2) - (mean(X))^2$
- $Var(aX + bY) = a^2Var(X) + b^2Var(Y)$

X,Y are independent; a, b are constants

Programing for HW2

- ▶ Compute the mean and variance
- ▶ Sample mean

$$\hat{\mu} = \frac{1}{N^2} \sum_{1 \leq x \leq N} \sum_{1 \leq y \leq N} I(x, y)$$

- ▶ Sample variance

$$\hat{\sigma}_D^2 = \frac{1}{N^2 - 1} \sum_{1 \leq x \leq N} \sum_{1 \leq y \leq N} (I(x, y) - \hat{\mu})^2$$

Programing for HW2

- ▶ Given four images, we get four pairs of (μ, σ_D^2) .
- ▶ Fit a line by Least Square to these points and get an estimation of A and σ_C^2
- ▶ We will provide hw2.c for you to use.

Submission Guideline

- Demonstrate your program during regular meetups.
- The demo will be at 3pm, Jan 27, in lab.
- Compress your program and written answers into one single file and submit the compressed file to EEE by January 27 midnight

Grading Criteria

- ▶ Total 100 points
 - 15 points for each of the first three problems
 - Partial credit will be allowed for the questions per problem
 - 55 points for the last problem
 - 15 for demonstrating your program
 - 10 for computing the mean and variance
 - 20 for estimating the two quantities from the four images, 5 for each image
 - 10 for the linear fit