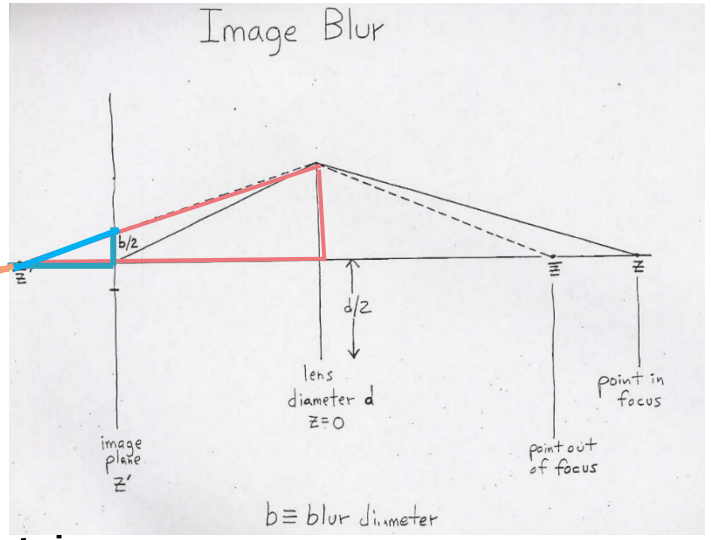
EECS101 Discussion 2

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

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

- Assumptions to use
  - the noise components are independent
  - $Var(N_P) = Mean(S + N_{DC})$

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

    X,Y are independent; a, b are constants

Programing for HW2

- Compute the mean and variance
- Sample mean

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

- Sample variance

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

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
  - Plot and fit may not necessarily be done in .C
- We will provide hw2.c for you to use.
  - Note:
    - your programs should be able to locate the input images
    - Function gets()

Demo

- Compile and run your code.
- Print the 4 means and variances on the screen/window and show.

HW2 Submission Guideline

- Submit your program, graphs, written answers, ~~and the demo video~~ to Canvas before next ~~Wednesday~~ midnight.
- Double check your submission before next ~~Wednesday~~ midnight.
- Plan ahead (for networking problems).

HW2 Grading Criteria

- Total 100 points
  - 20 points for each of the first two problems
    - Partial credit will be allowed for the questions per problem
  - 60 points for the last problem
    - 10 for demonstrating your program ~~(Demo Video)~~
    - 10 for the proofs of the two equations (Expected value and variance of D)
    - 20 for computing the means and variances
    - 10 for estimating the two quantities from the four images
    - 5 for the linear fit
    - 5 for submitting the program (.c files)