# Precision Vs. Accuracy

*And Significant Figures*

# Accuracy Precision

Error-Prone & Doubtful

Repeatable & Reproducible

# Measurements

| measured focal lengths | | | | actual focal length |
|---|---|---|---|---|
| Test 1 | Test 2 | Test 3 | Test 4 | |
| 0.09 | 0.0926687 | 2.7225832 | 2.05 | 0.095068 |
| 0.09 | 0.0943377 | 2.7190492 | 0.55 | |
| 0.085 | 0.0949311 | 2.7185901 | 5.98 | |
| 0.1 | 0.0955926 | 2.7200295 | 6.71 | |
| 0.091 | 0.0963169 | 2.7194028 | 0.23 | |
| 0.09 | 0.0953809 | 2.7199902 | 1.01 | |
| 0.089 | 0.0962467 | 2.7200002 | 2.22 | |

# Info.

- Accuracy depends on the instrument you are measuring with
- "Increased accuracy can be achieved with the use of variable shape pixels each chosen to represent the image being displayed"
- "Increased precision is accomplished with higher resolution of square pixel images"

http://nvlpubs.nist.gov/nistpubs/jres/115/3/V115.N03.A03.pdf

Figure 1

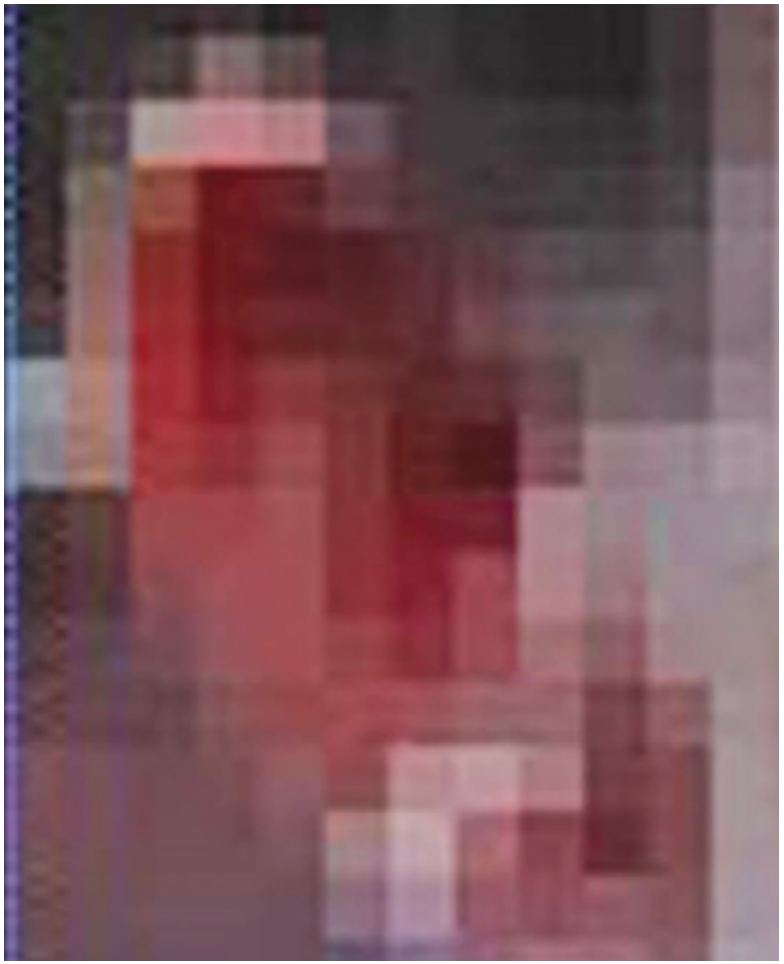
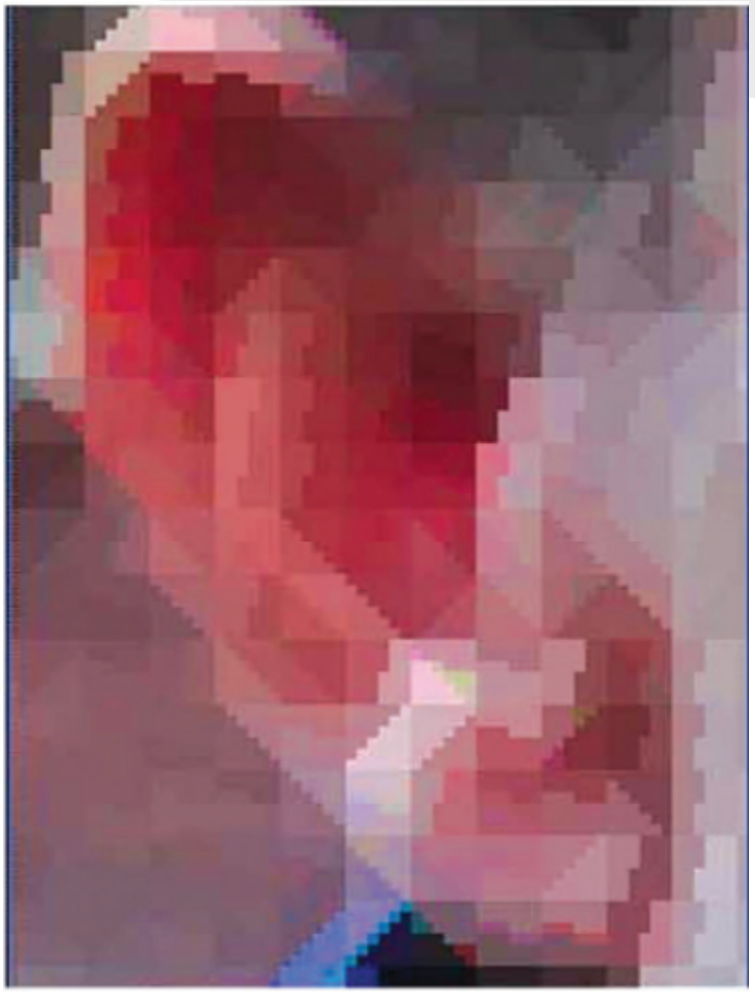


Figure 2



# Imaging Corner Detector

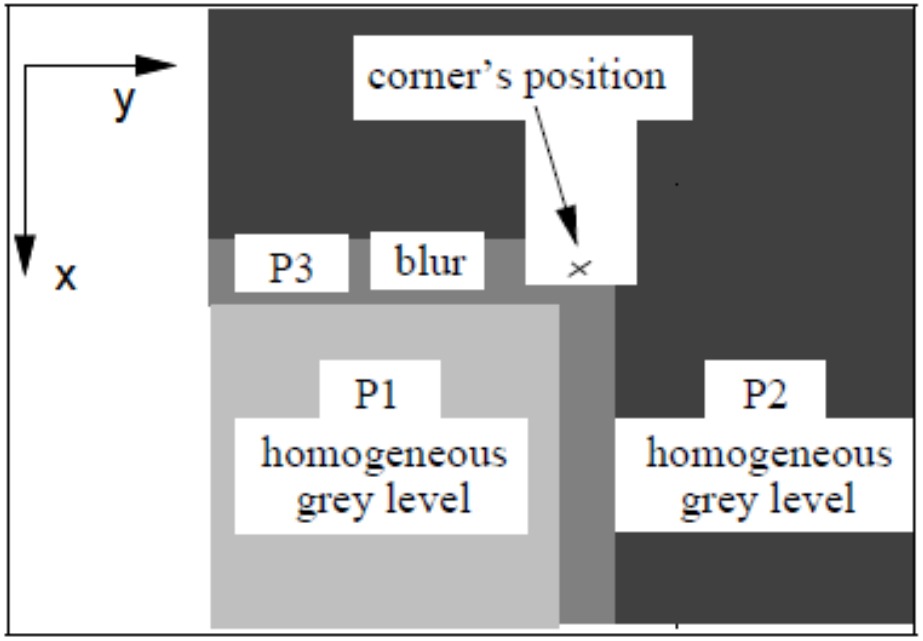
- Obstacles
- Calibration method
- Cross Ratio

# Obstacles

- Electronic Noise
- Optical Noise
- Software Noise

# Calibration Method

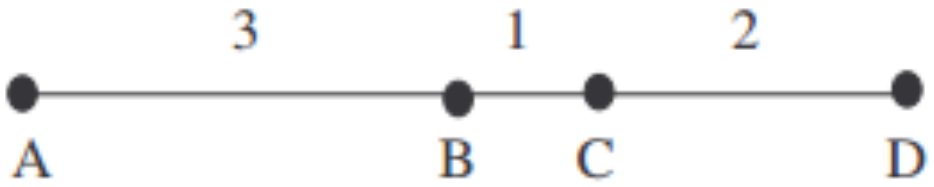
- Goal - obtain precise location of corners
- Method - model-based algorithm
- L-corners



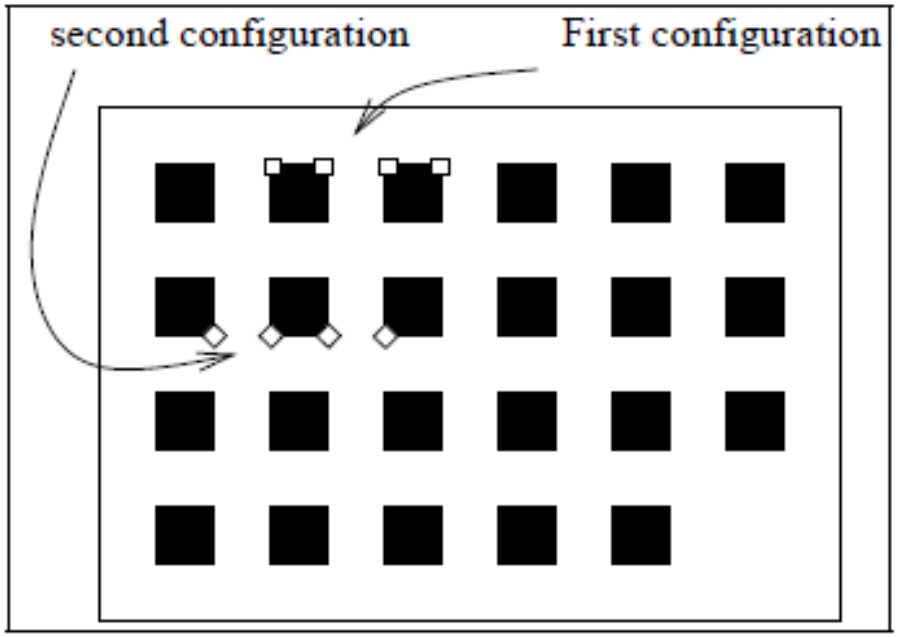
# Cross Ratio

$$K(a,b,c,d) = \frac{a-c}{a-d} \div \frac{b-c}{b-d}$$

**Example 1:**




$$\Re(A, B; C, D) = \frac{AC}{BC} \Big/ \frac{AD}{BD} = \frac{4}{1} \Big/ \frac{6}{3} = 2.$$




| Image number | Plane number | Number of cross-ratios | Mean $\bar{K}$ | Standard Deviation $\sigma_K$ | Max error | Distance $\lambda$ in 2D | Accuracy $\sigma$ | Probability to have a Gaussian |
|---|---|---|---|---|---|---|---|---|
| Image 1 | 1 | 54 | 4.004 | 0.055 | 0.138 | 20.12 | 0.12 | 0.891 |
| | 2 | 54 | 4.005 | 0.053 | 0.145 | 19.74 | 0.12 | 0.964 |
| | 3 | 54 | 4.006 | 0.064 | 0.145 | 19.36 | 0.14 | 0.997 |
| | All | 162 | 4.005 | 0.057 | 0.145 | 19.74 | 0.13 | – |