* Measurement accuracy.

Measured values x = 100. 🡪 resolution: 1

x =100.0 🡪 resolution: 0.1

* Mean , variance

Standard Deviation   
🡪 statistics:

Sample mean(average)

Sample variance

Standard deviation

Example:

- measure the height of students. Two scalers (A,B)

1) (A,B) scalers have the same resolution 10mm. The measured figures are rounded. i.e., 161, 173,167,… cm. These are random variable with a uniform probability density as

-5mm 161 5mm

If you measure the height with the A scaler, and the rounded figure is x cm, the real height is between

So the figures measured are random variable, and its probability density is uniform as

In general, assume the resolution is a, then the pdf is

Calculate the mean and variance of x

* The previous example

🡪 resolution: 1

🡪 resolution: 0.1

7. Static system Estimation

1. Model: ,
2. Measurements:

* Simple Estimator

1. Batch type
2. Recursive type(real time)

Multiply at both sides

Then

\*We did not use the fact of .

* Kalman’s weighting
* Assume

1. Assume the estimator is unbiased

which implies

Therefore

The prediction error:

Or the residual (why prediction?)

1. Minimum variance, find the optimal gain

Since , therefore

Using variational calculus to find the minimum ,

Consequently,

Implies

1. In conclusion the minimum variance estimator is

* (7.13) is called Riccati equation.