Laboratory #1: parametric estimation of static models for a position transducer using the statistical approach

Introduction to I part (15/03/2021 videotape on Teaching Portal: 00:00 - 15:00)

First part (with your PC, 30 minutes):
- System description
- Problem setup for a linear approximation of the sensor characteristic
- Parametric estimation of a linear model (w.r.t. data) using least squares
- Plot of the estimated approximation versus the experimental data

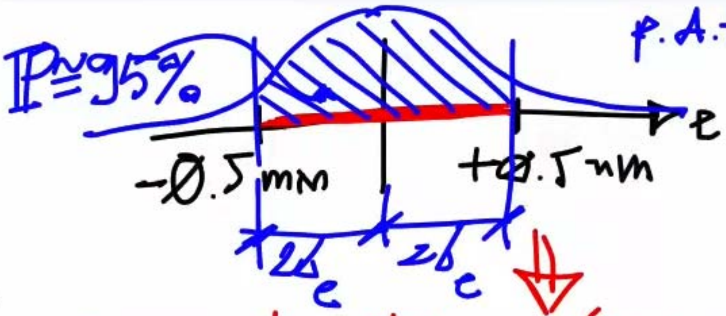
Comments on I part (video: 16:30 - 28:00), introduction to II part (28:00 - 1:03:00)

Second part (with your PC, 40 minutes):
- Computation of parameter confidence intervals (noise variance derived from priors)
- Plot of these confidence intervals versus the estimated approximation
- Computation of parameter confidence intervals (noise variance estimated from data)
- Plot of these confidence intervals versus the estimated approximation

Comments on II part (1:03:00 - 1:10:30), introduction to III part (1:10:30 - 1:17:00)

Third part (with your PC, 25 minutes):
- Problem setup for a polynomial approximation of the sensor characteristic
- Parametric estimation of polynomial models (w.r.t. data) using least squares
- Plot of the estimated approximations versus the experimental data

Comments on III part (video, 1:17:30 – 1:25:30)



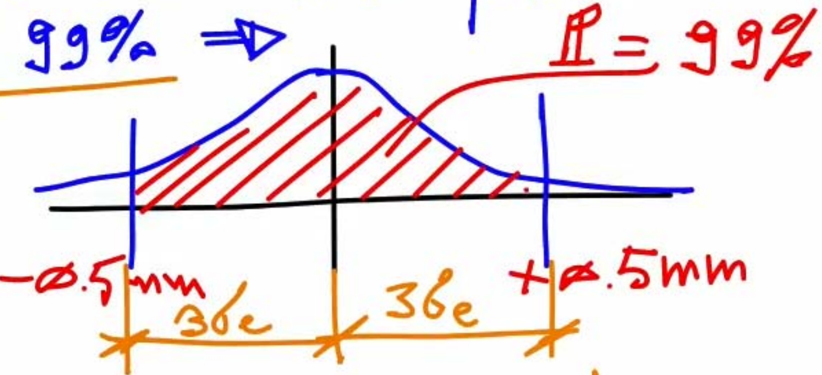
$|e| \le 0.5\,mm$

How to transform this into a suitable p.d.f.?

I need to have a **normal** p.d.f.

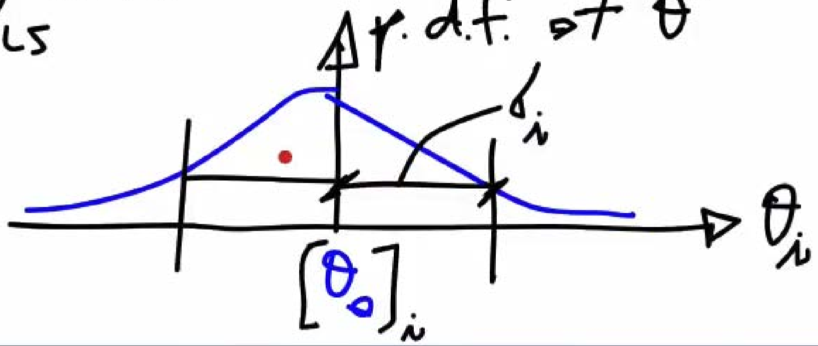
$\Rightarrow 0.5\,mm = 2\sigma_e$

If you trust the prior info with 99% $\Rightarrow$



$\Rightarrow 0.5\,mm = 3\sigma_e$

$\hat{\theta}$ has p.d.f. depending on p.d.f. of the noise:
if e is Gaussian with $\emptyset$ mean $\Rightarrow$
$\hat{\theta}_{LS}$ is Gaussian with $E[\hat{\theta}] = \theta_0$



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