EC 5142 Sep. 5 2011

Note Title 05-09-2011

For Fourier series, the basis functions were

$e^{jk\Omega_0 t}$ $\quad k = 0, \pm 1, \pm 2, \ldots$

Generalized FS expansion:

$$x(t) = \sum_k{}' a_k \phi_k(t)$$

$$\langle x(t), \phi_l \rangle = \sum_k a_k \langle \phi_k(t), \phi_l(t) \rangle$$

If $$\langle \phi_k(t), \phi_l(t) \rangle = \delta_{kl}$$

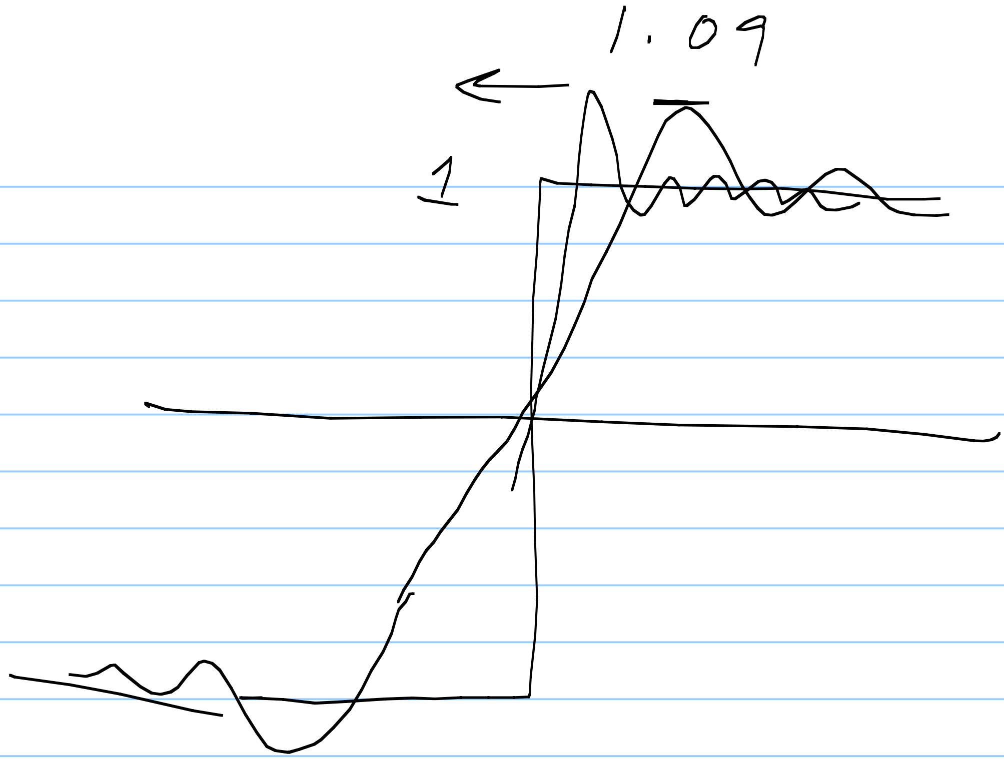
$$a_l = \langle x(t), \phi_l(t) \rangle$$

$$\langle p(t), q(t) \rangle = \int_R p(t)\, q^*(t)\, dt$$

For the Fourier basis $\langle e^{jk\Omega_0 t}, e^{jl\Omega_0 t} \rangle = T\,\delta_{kl}$

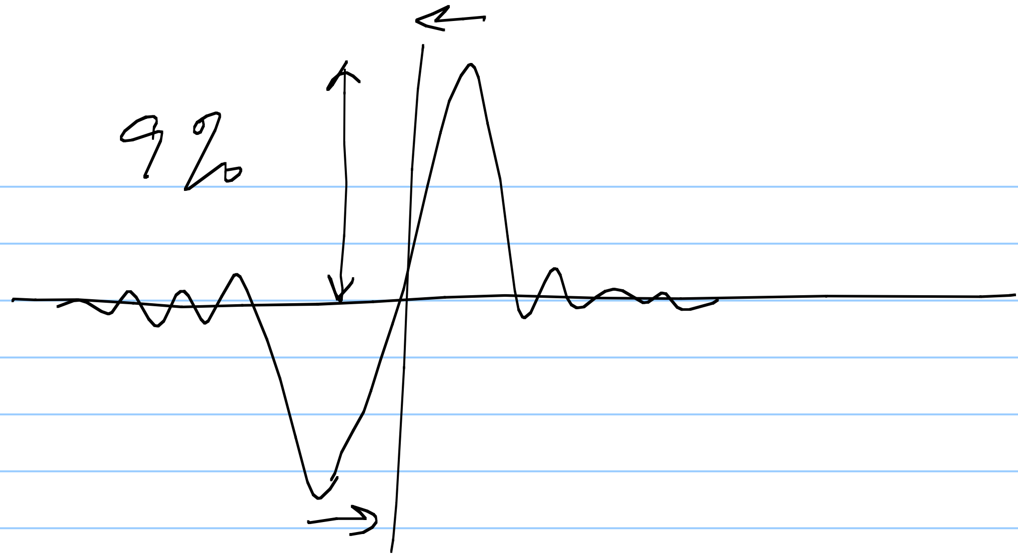
<u>Convergence</u> Does FS expansion converge?

How does it converge?

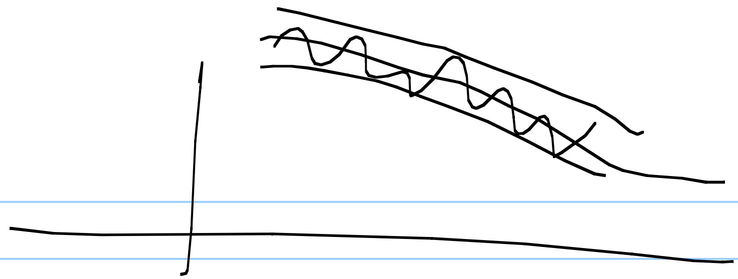


9% overshoot

$$x_N(t) = \sum_{k=-N}^{N} a_k e^{jk\Omega_0 t}$$



$x_N(t)$ as $N \to \infty$, will not converge to $x(t)$ <u>pointwise</u>



$$e(t) \not\to 0 \quad \forall t$$

$$\frac{1}{T}\int_T |e(t)|^2 \, dt \to 0$$

Mean square convergence