

Adaptív szűrők hatékony megvalósítása

Önálló laboratórium mechatronikusoknak

Szőke Kálmán Benjamin

Konzulens: Sujbert László

2015. Május 20.

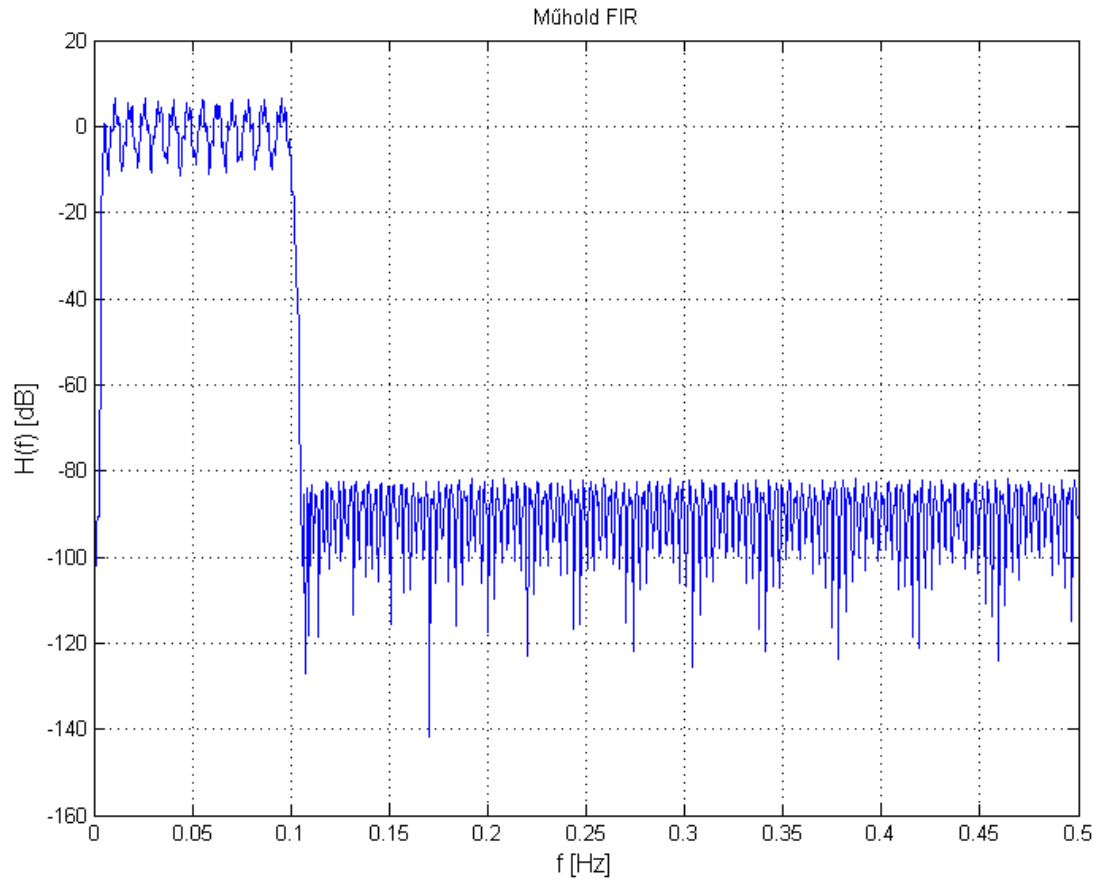
Tartalom

1. Feladataim
2. LMS
3. NLMS
4. FxLMS
5. ELMS
6. Overlap and Add

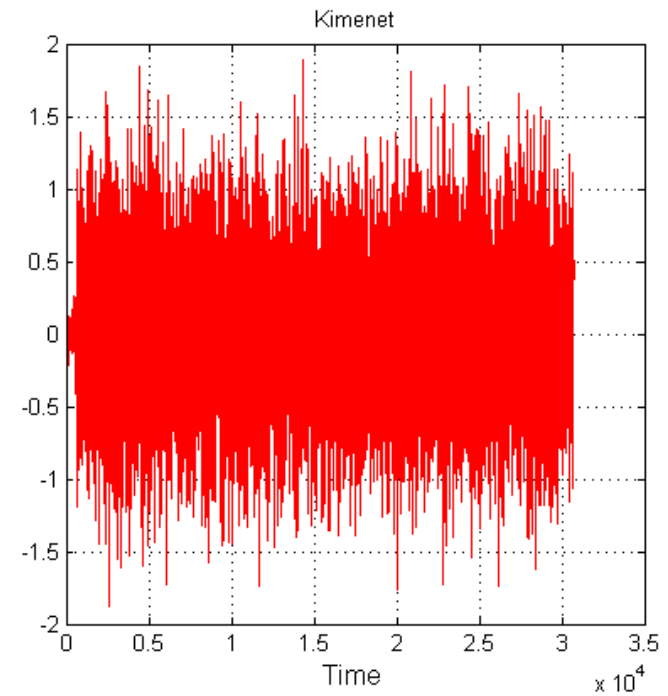
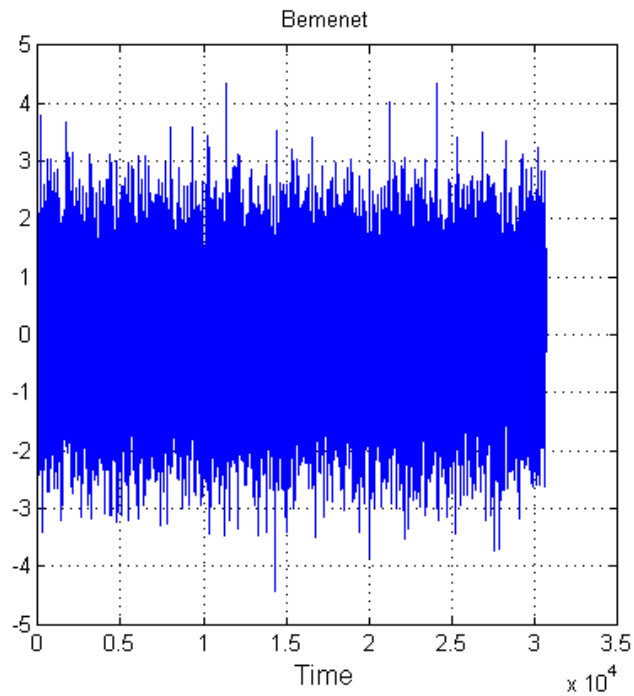
Feladataim

- Identifikáció
- Overlap and Add eljárás adaptív szűrőkhöz

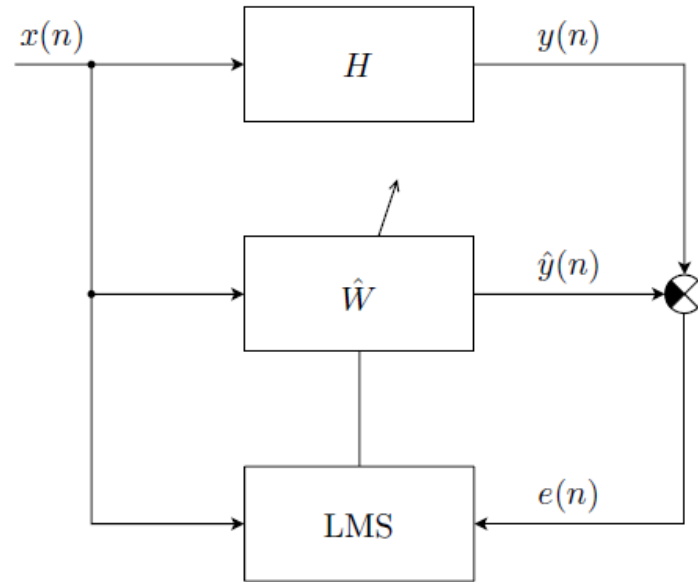
Identifikáció műhold szűrőre



Fehérzajjal való gerjesztés



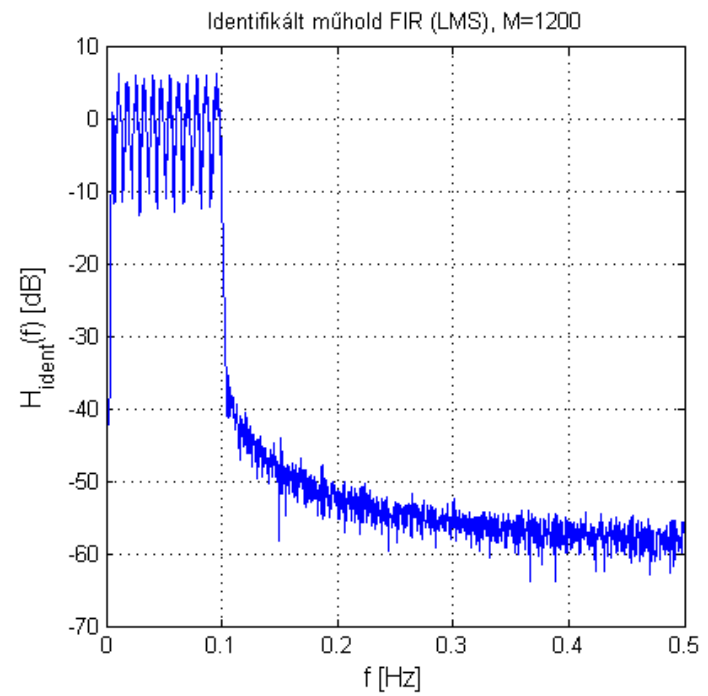
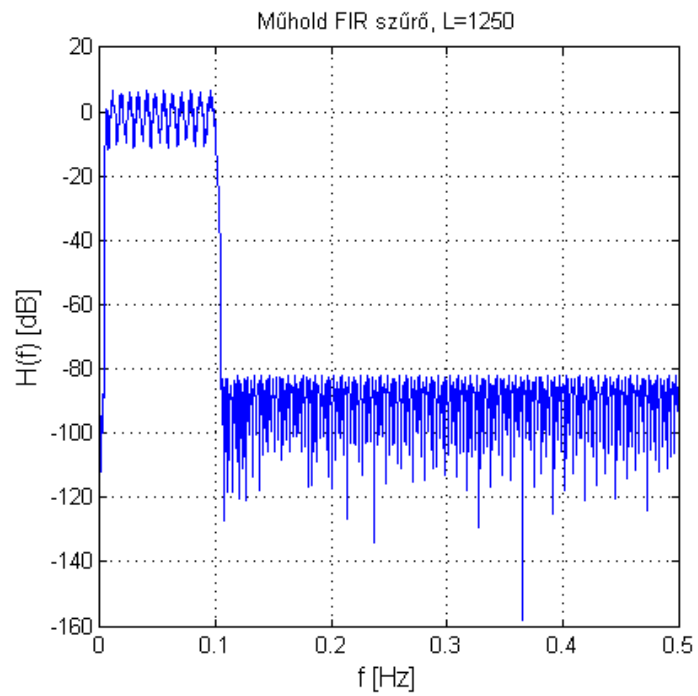
LMS



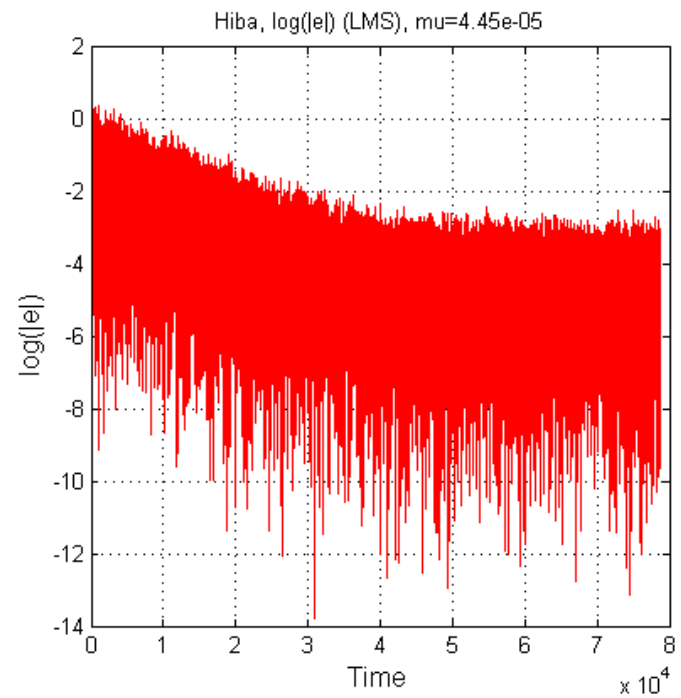
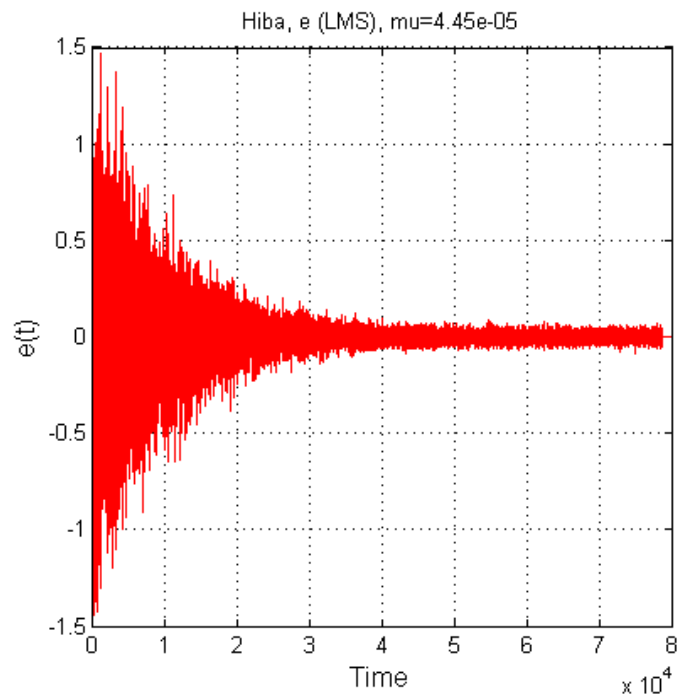
$$e(n) = y(n) - \hat{\mathbf{w}}^T(n)\mathbf{x}(n)$$

$$\hat{\mathbf{w}}(n+1) = \hat{\mathbf{w}}(n) + 2\mu e(n)\mathbf{x}(n)$$

LMS



LMS

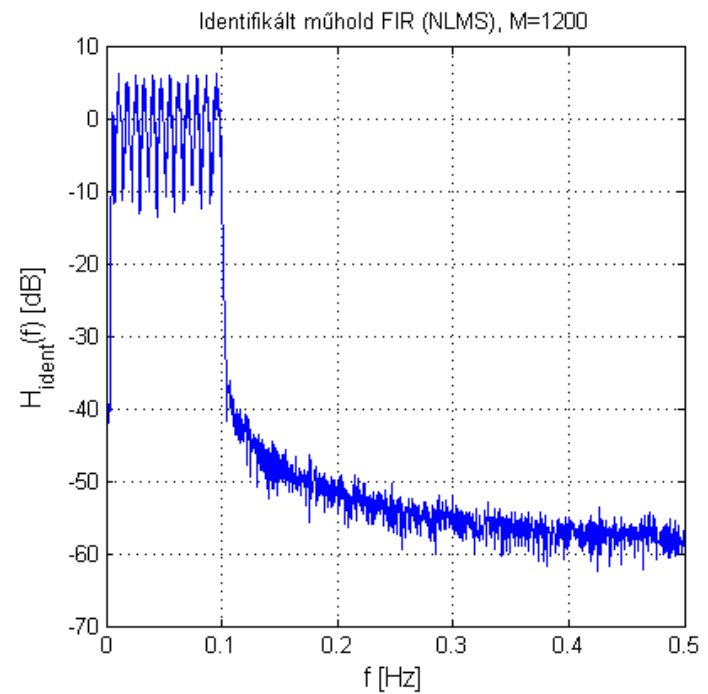
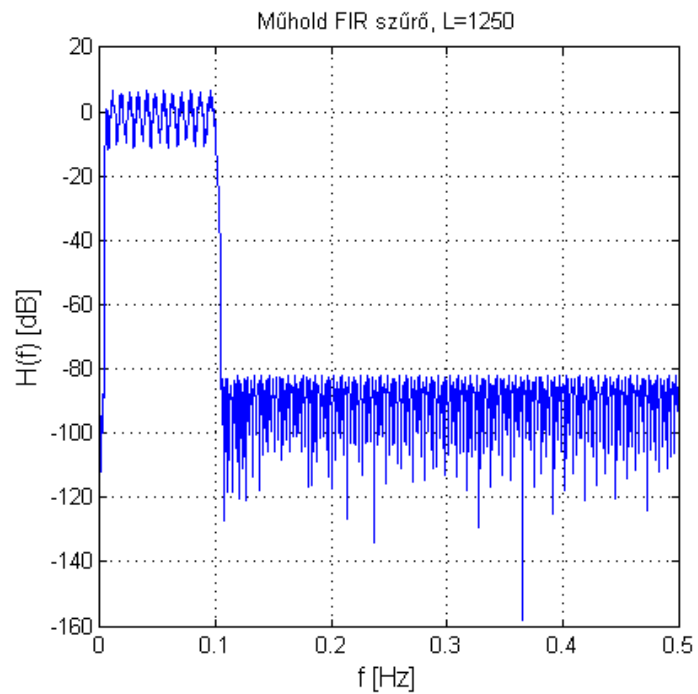


NLMS

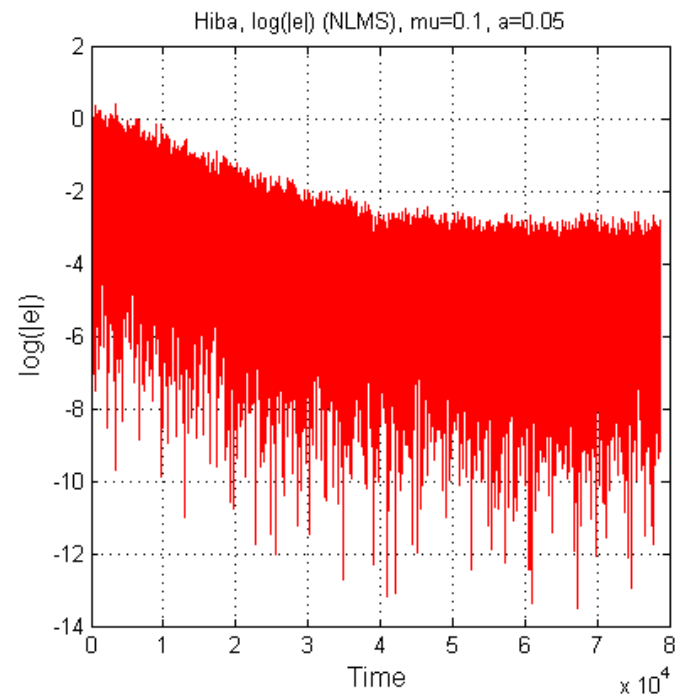
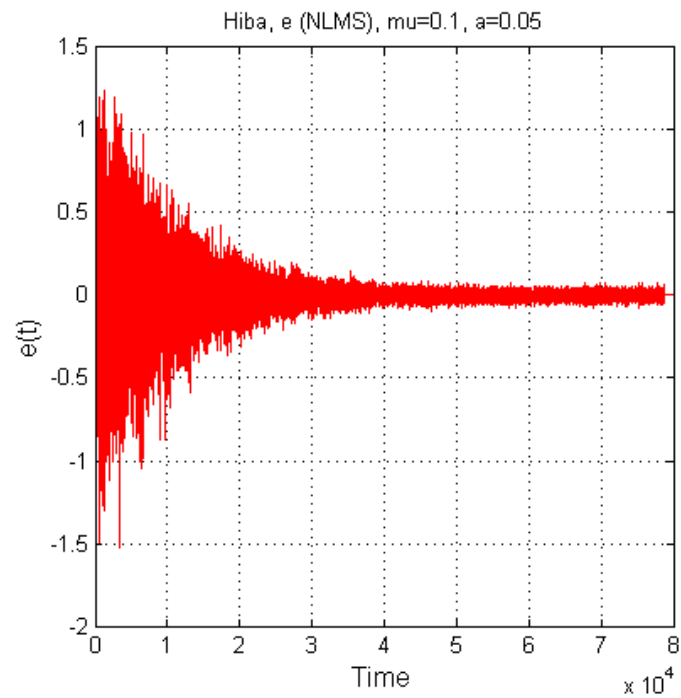
$$e(n) = y(n) - \hat{\mathbf{w}}^T(n)\mathbf{x}(n)$$

$$\hat{\mathbf{w}}(n+1) = \hat{\mathbf{w}}(n) + \frac{\mu}{a + \mathbf{x}^T \mathbf{x}} e(n)\mathbf{x}(n)$$

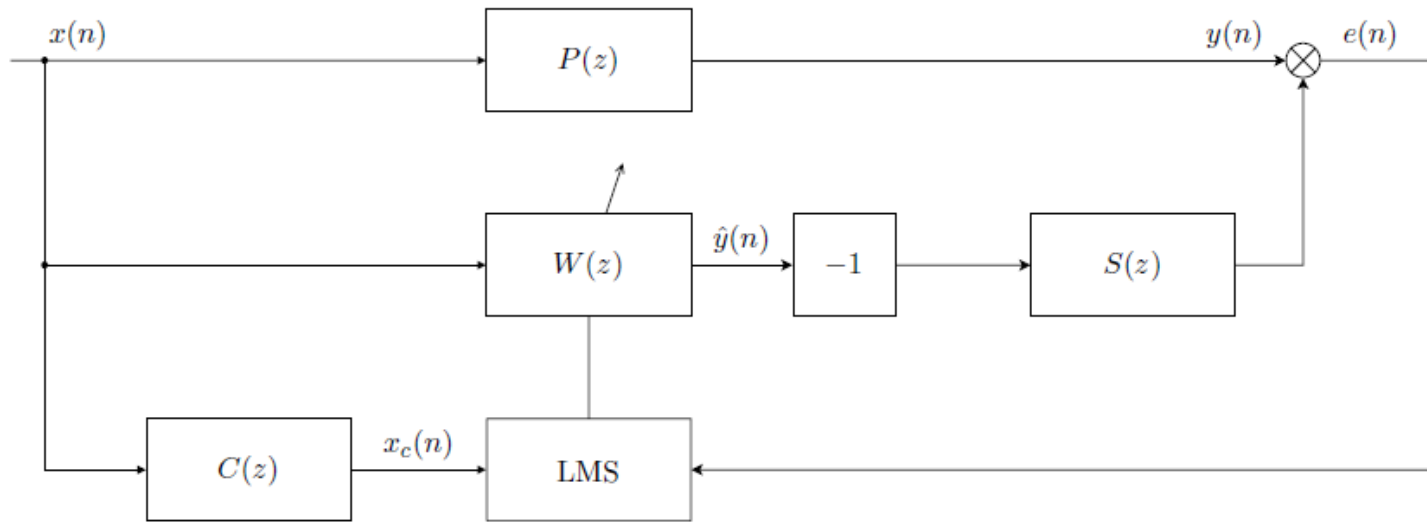
NLMS



NLMS



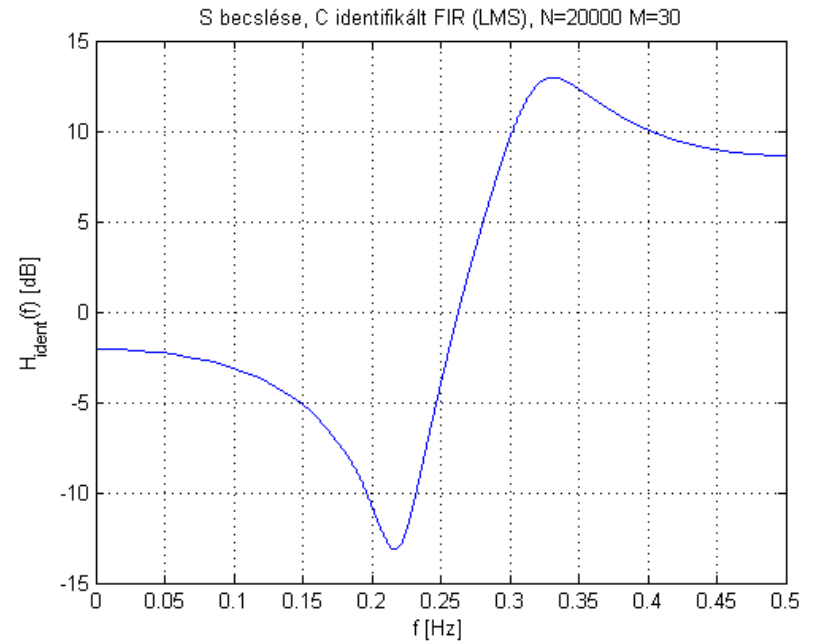
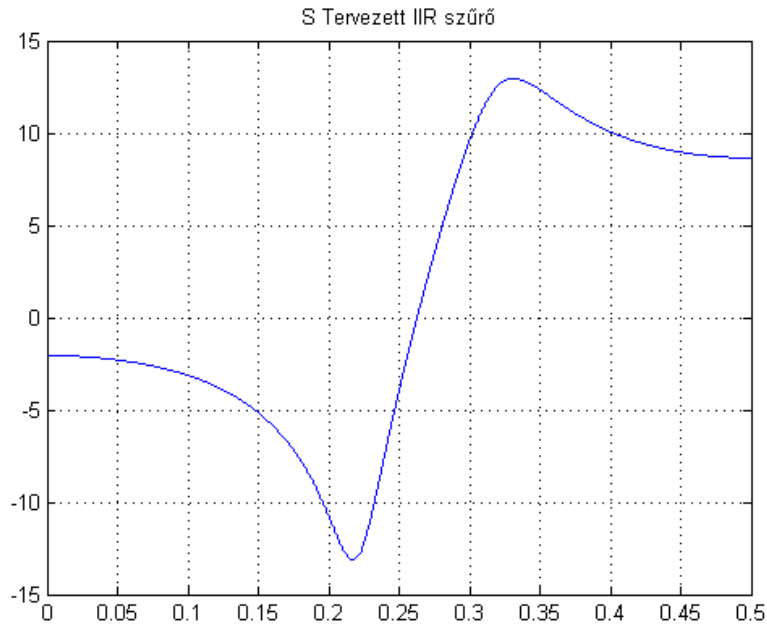
FxLMS



$$e(n) = y(n) - \hat{\mathbf{w}}^T(n) \mathbf{x}_c(n)$$

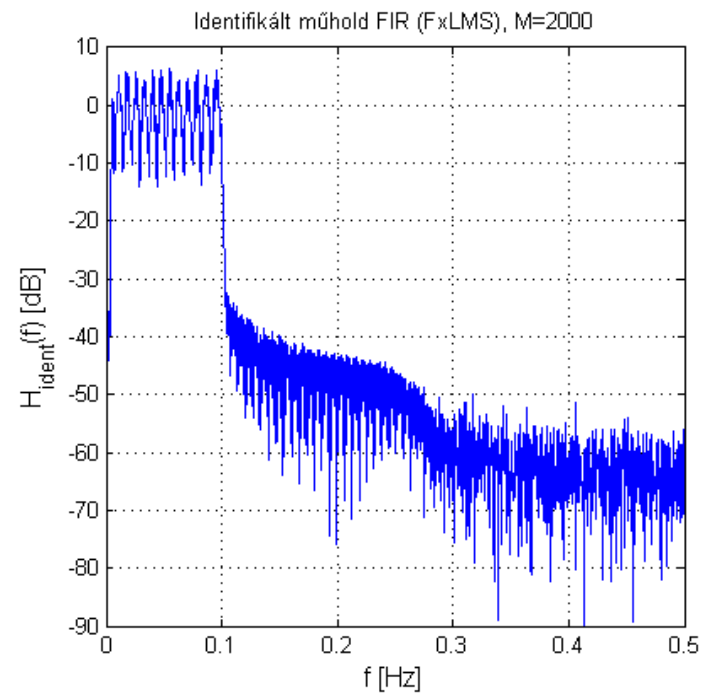
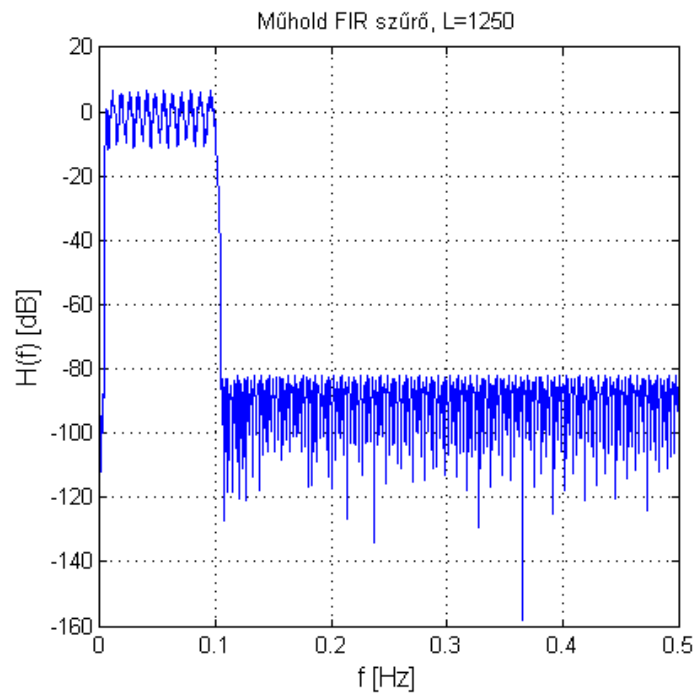
$$\hat{\mathbf{w}}(n+1) = \hat{\mathbf{w}}(n) + \mu e(n) \mathbf{x}_c(n)$$

FxLMS

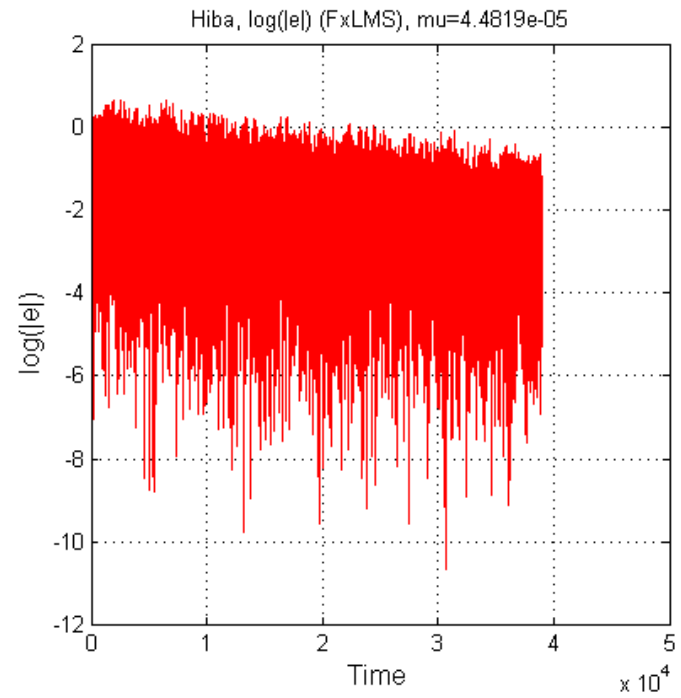
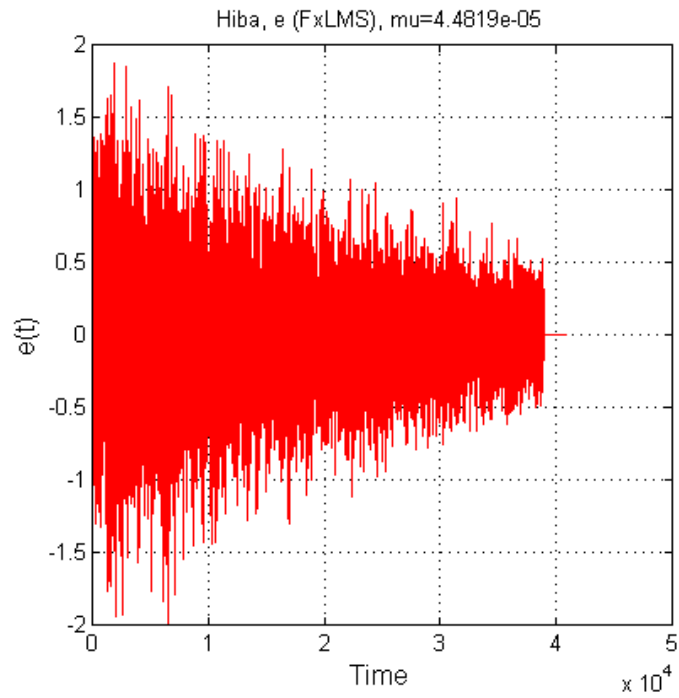


$$S(z) = \frac{z^2 - 0.4164z + 1.2346}{z^2 + 0.6627z + 0.6414}$$

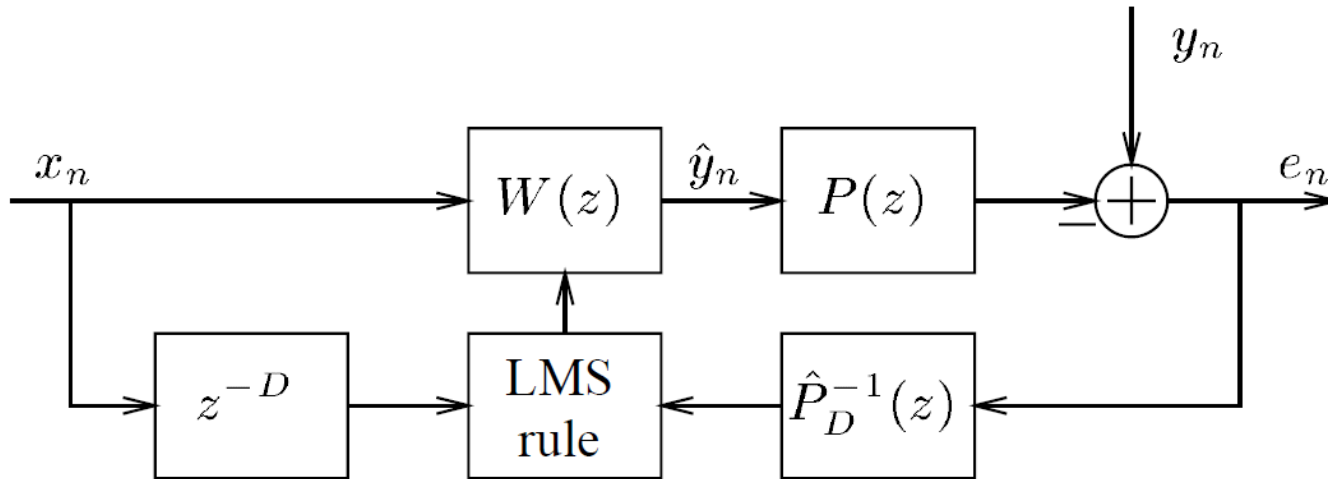
FxLMS



FxLMS



ELMS



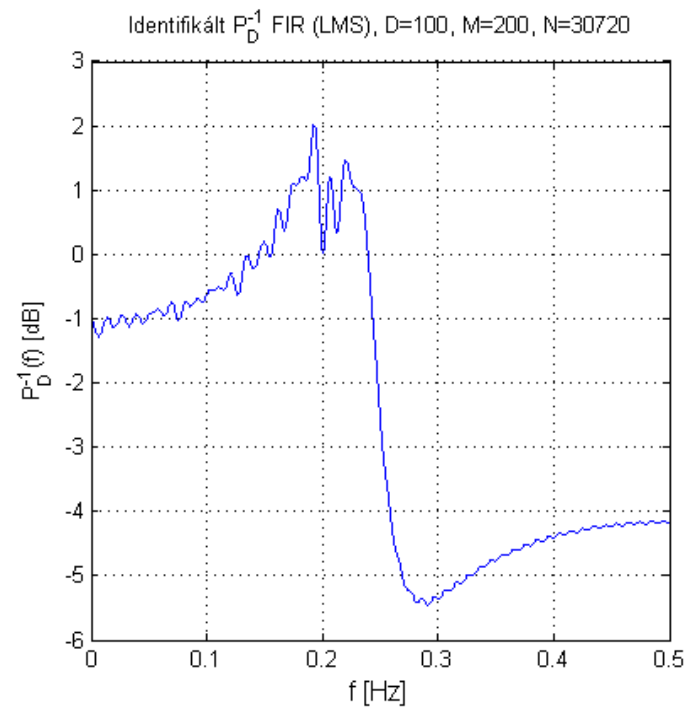
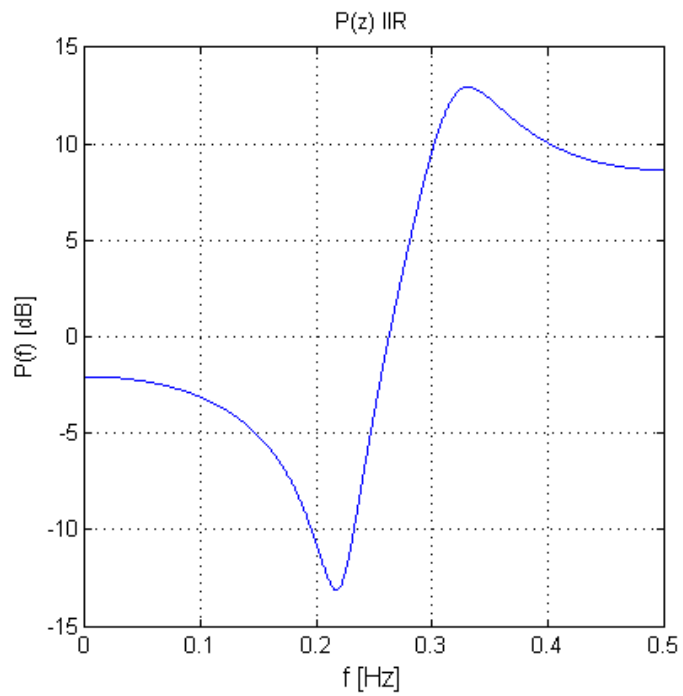
$$\hat{y}(n) = \hat{\mathbf{w}}^T(n) \mathbf{x}(n)$$

$$e(n) = y(n) - P(z) \hat{y}(n)$$

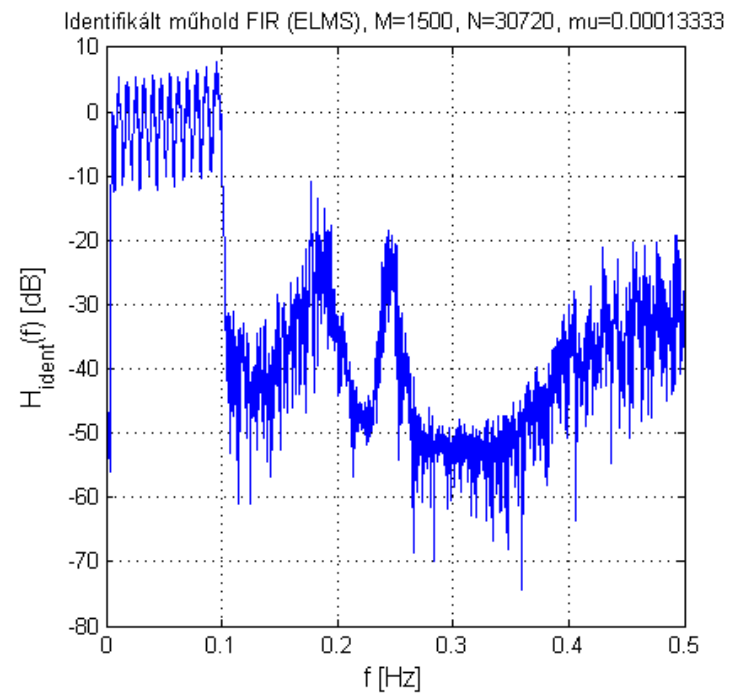
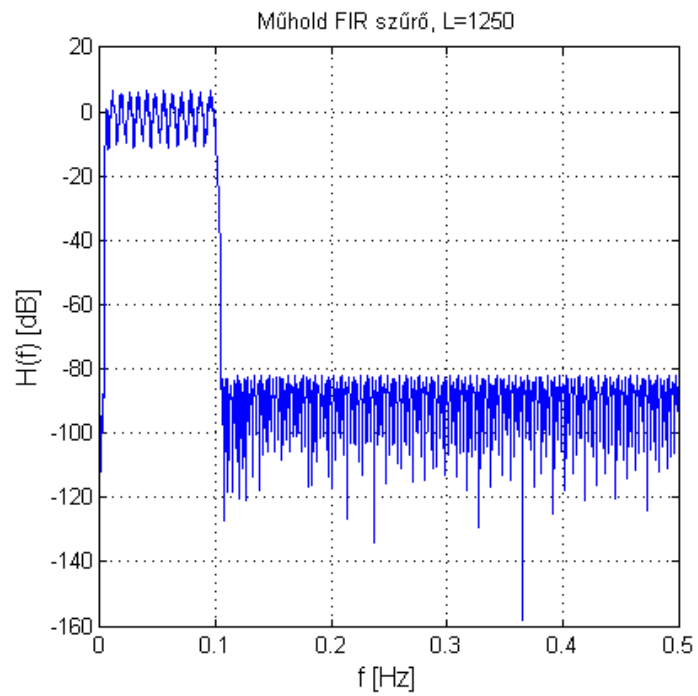
$$\hat{\mathbf{w}}(n+1) = \hat{\mathbf{w}}(n) + \mu \hat{P}(z)_D^{-1} e(n) \mathbf{r}(n)$$

$$\mathbf{r}(n) = z^{-D} \mathbf{x}(n)$$

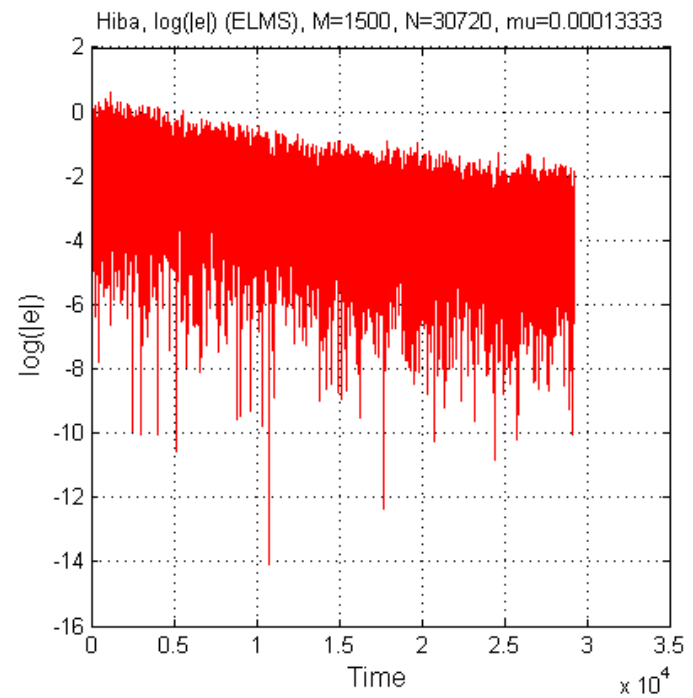
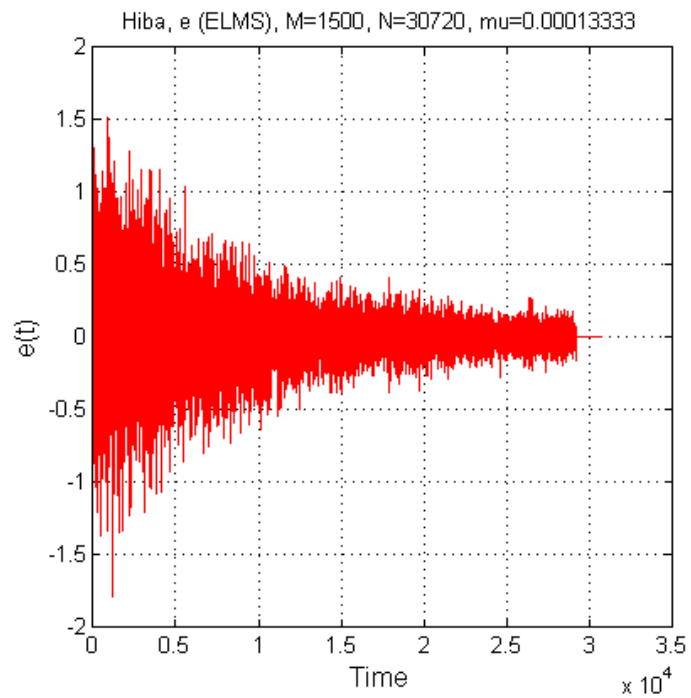
ELMS



ELMS

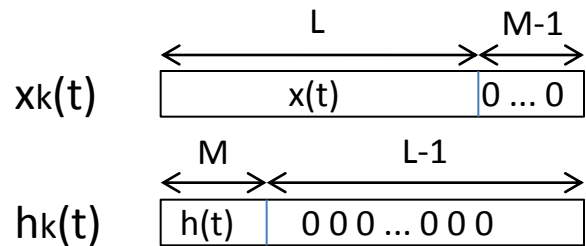


ELMS

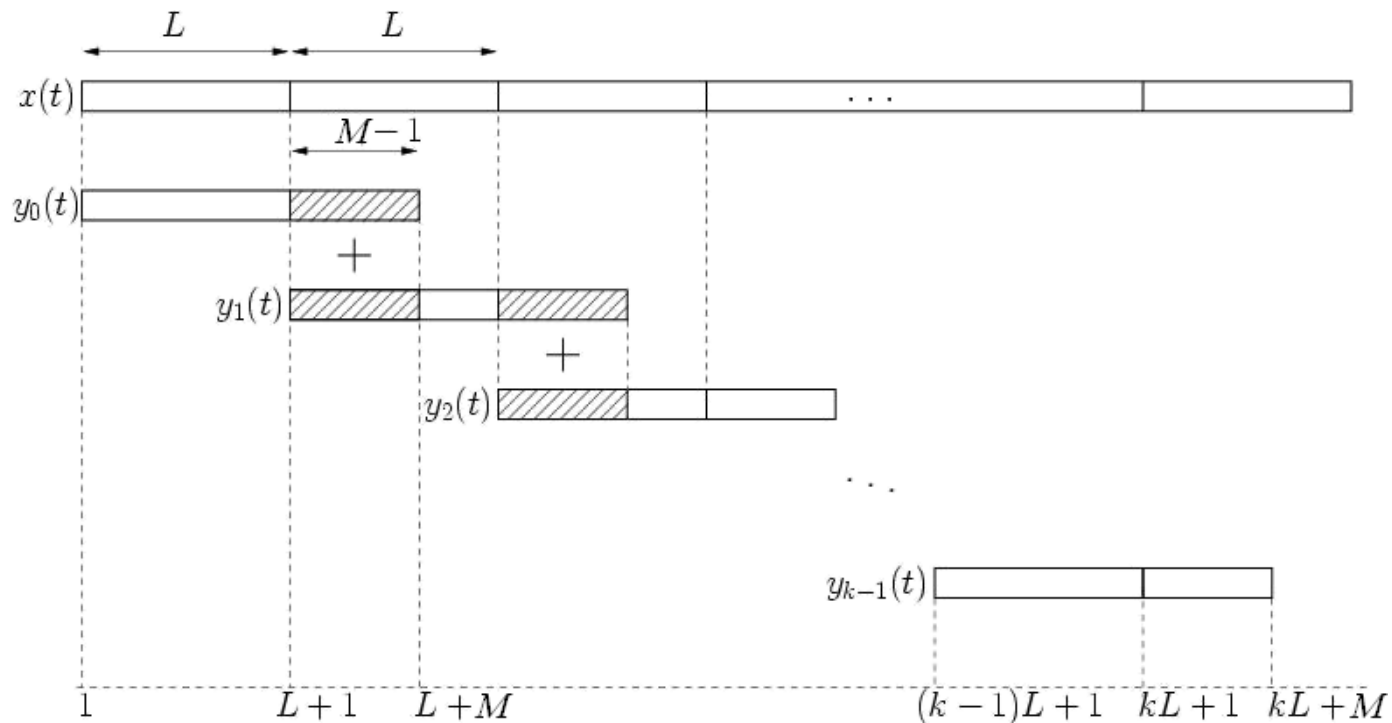


OLA

Cél: Hosszú adatsor szűrése FIR szűrővel

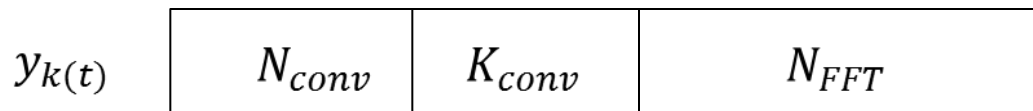


$$y_k(t) = IFFT\{FFT\{x_k(t)\} \cdot FFT\{h_k(t)\}\}$$

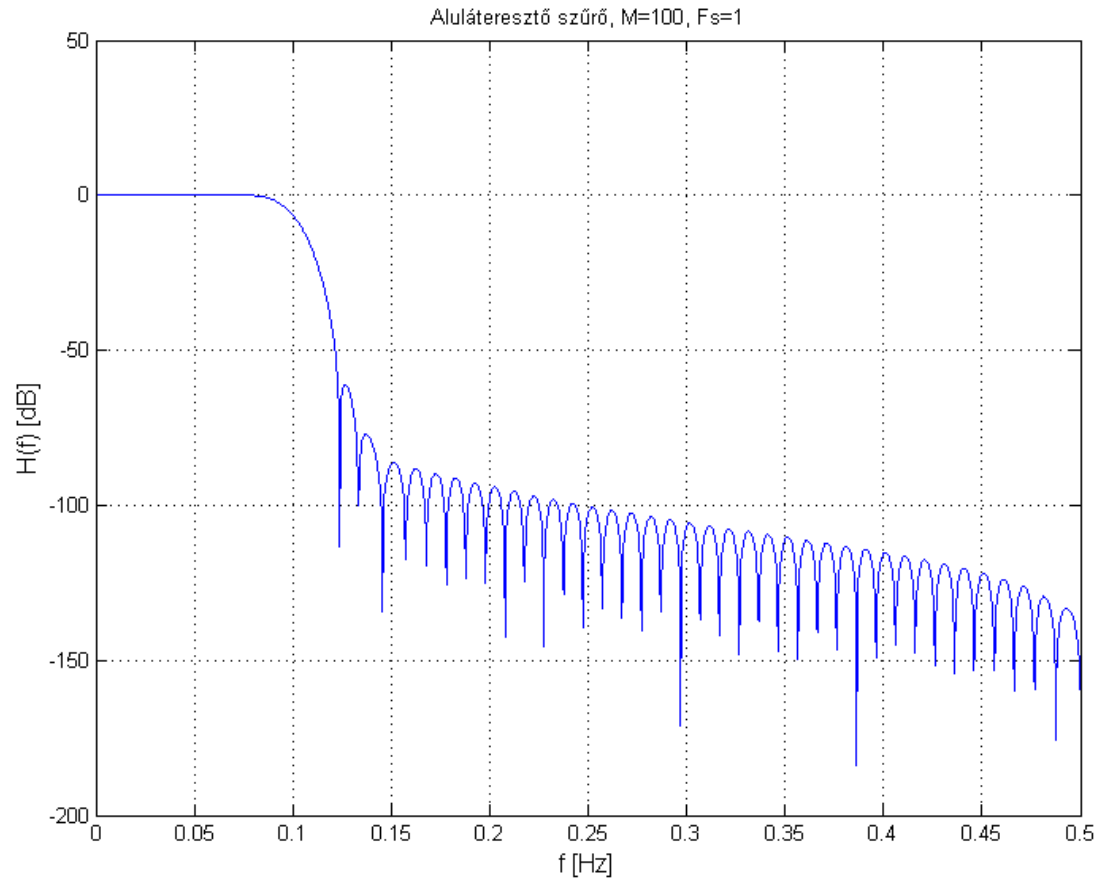


OLA

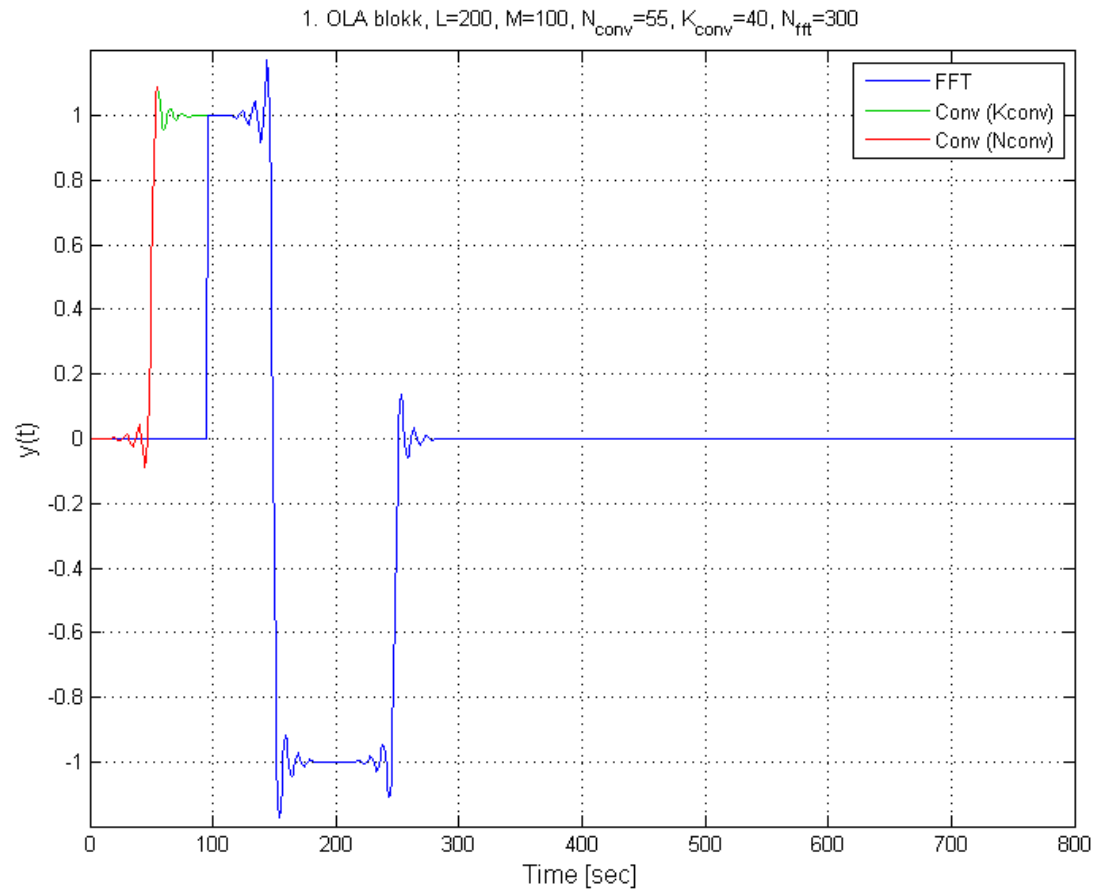
- Az Adaptív szűrők esetén a kimenten elvárjuk hogy folyamatosan legyen eredmény!
- Megoldás: Az OLA feldolgozását módosítjuk



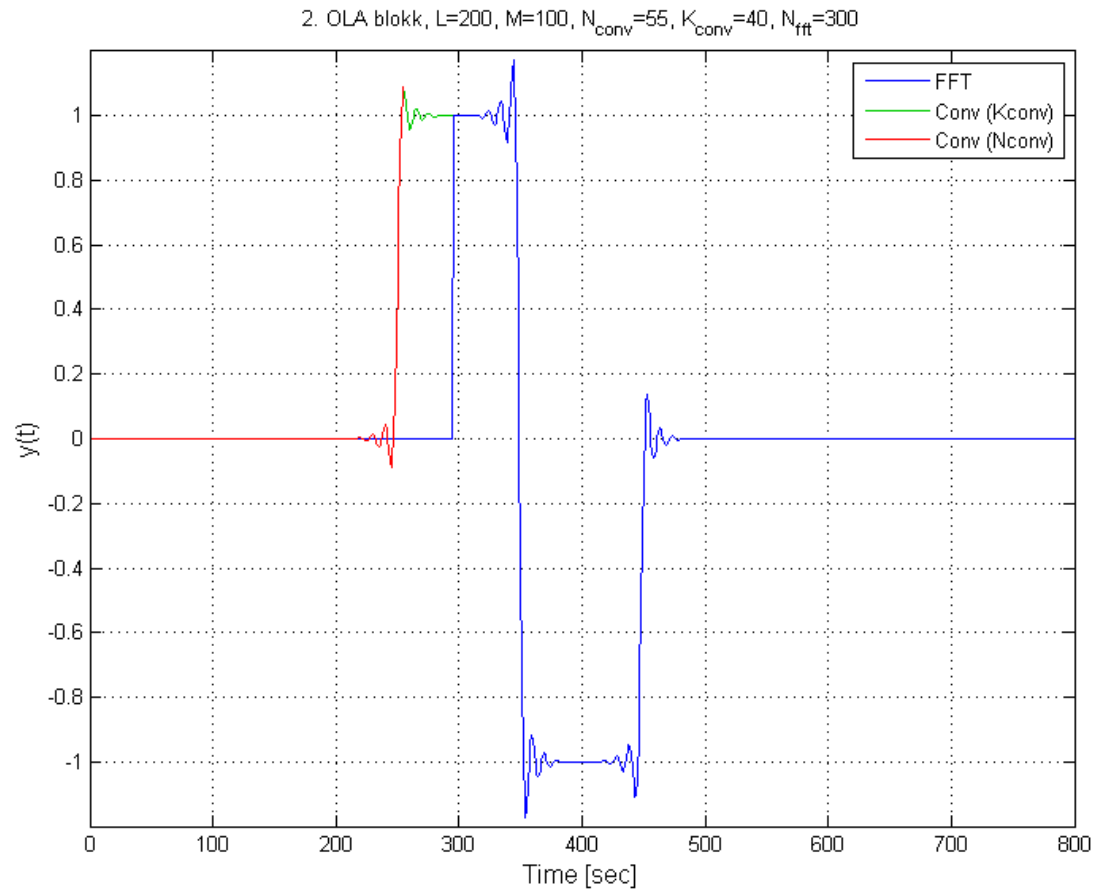
OLA



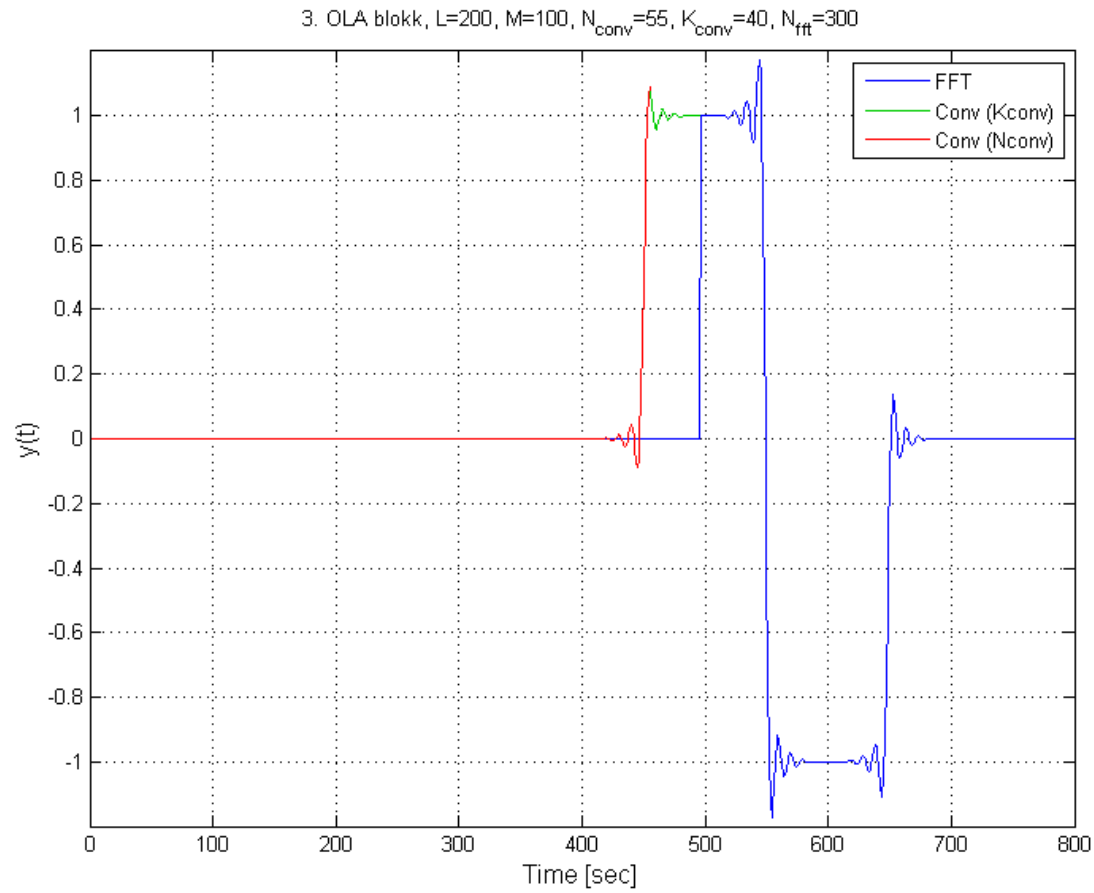
OLA



OLA

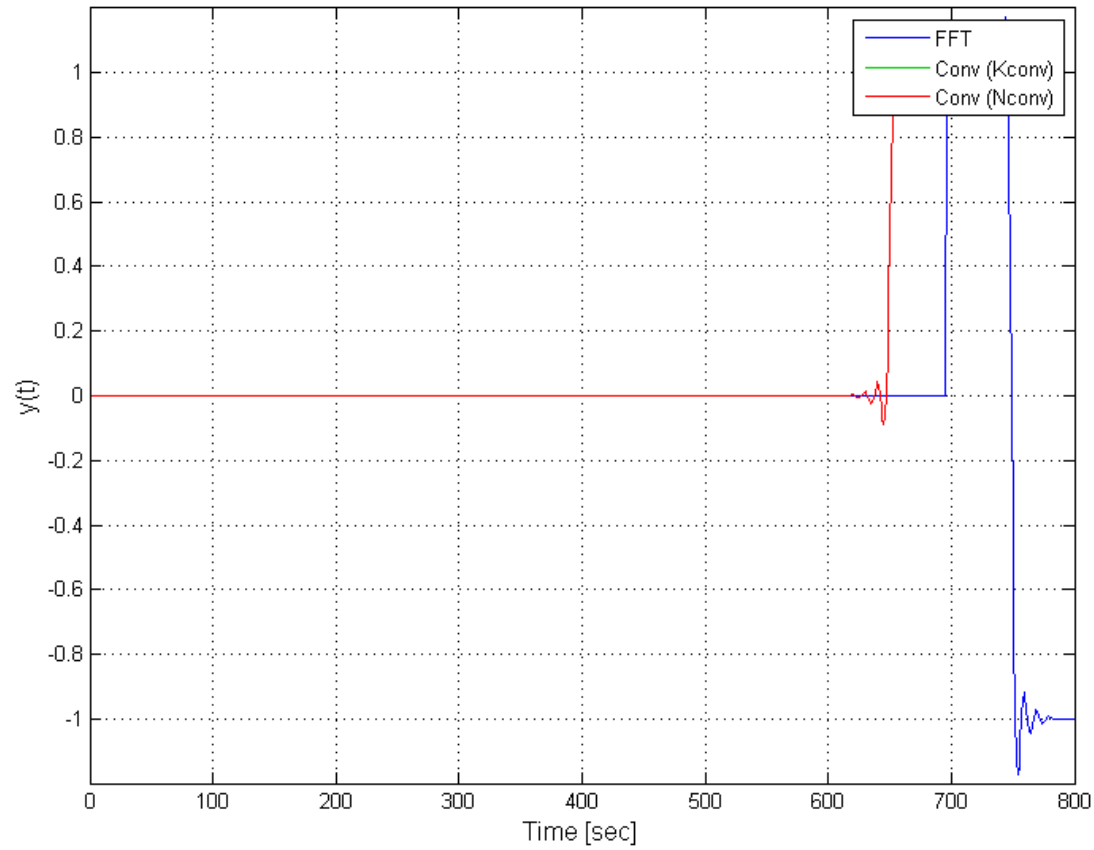


OLA

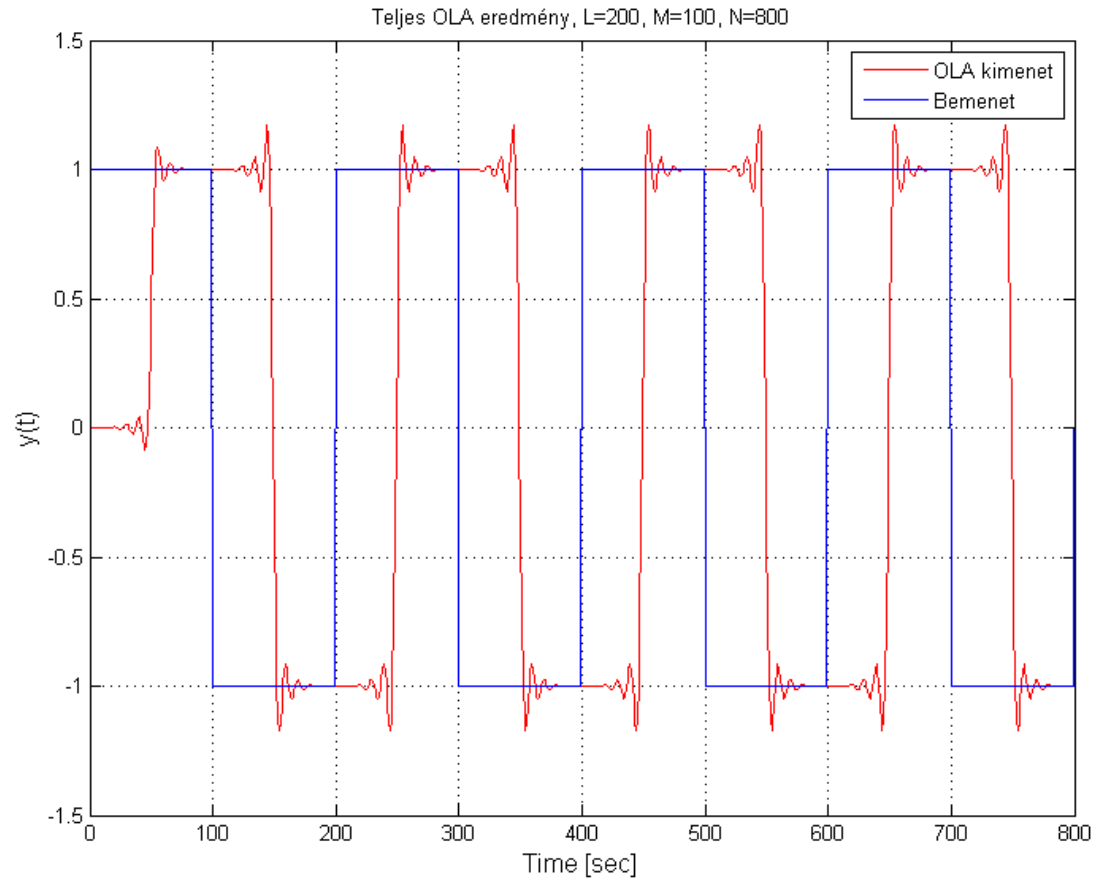


OLA

4. OLA blokk, $L=200$, $M=100$, $N_{\text{conv}}=55$, $K_{\text{conv}}=40$, $N_{\text{fft}}=300$



OLA



Köszönöm a figyelmet

- E-mail: egyszeregy@t-online.hu
- Felhasznált irodalom:
 - BME MIT - Információfeldolgozás laboratórium - 3. mérés: Adaptív szűrők vizsgálata
 - Bernard Widrow - Adaptive Signal Processing
 - Bernard Widrow - Adaptive Inverse Control: A Signal Processing Approach
 - Sujbert László: A Filtered Reference - Filtered Error LMS Algorithm
 - Wikipedia, the free encyclopedia - Overlap–add method