The problem of the modelling of GPS signal by means of neural networks

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$$x_n = \sum_{i=1}^{N} a_i x_{n-i} + \sum_{j=1}^{M} b_j \varepsilon_{n-j} + \varepsilon_n \qquad (1)$$

$$y_n = \sum_{i=0}^{N} a_i x_{n-i} + \sum_{i=1}^{M} b_i y_{n-i} \qquad (2)$$

$$y_n = \sum_{i=0}^{L} x_{n-i} \{ w_i + \sum_{j=0}^{L} x_{n-j} [w_{ij} + \sum_{k=0}^{L} x_{n-k} (w_{ijk} + \ldots)] \} \qquad (3)$$

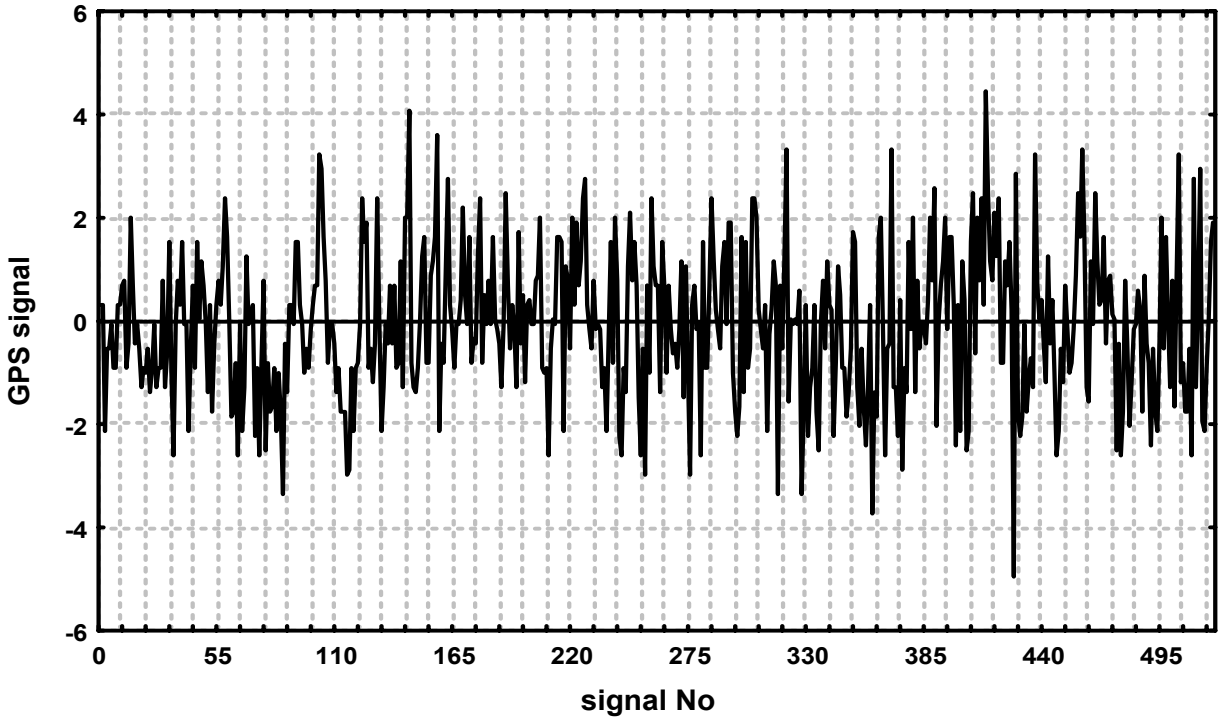
6
4
2
0
-2
-4
-6
GPS signal
0
55
110
165
220
275
330
385
440
495
signal No

Fig. 1

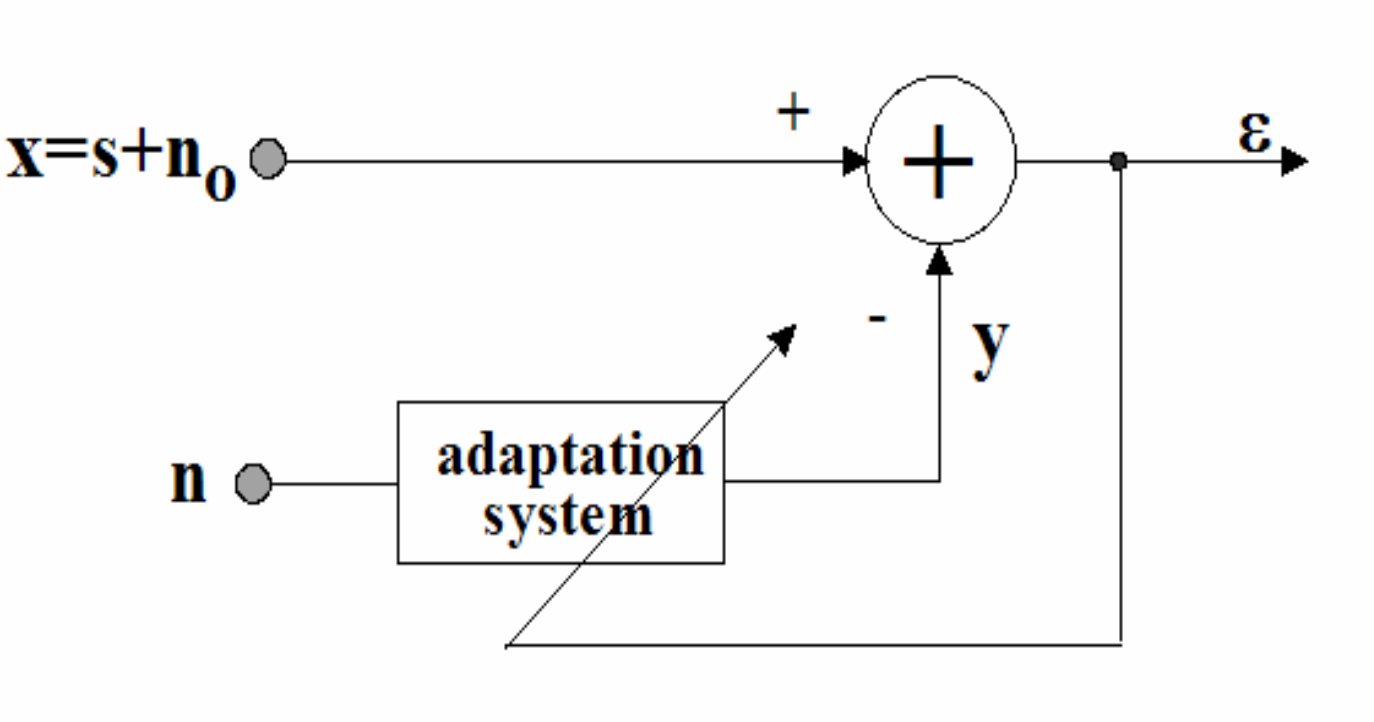

Fig. 2

$$y(k) = \sum_{l=0}^{L} w_l n(k - l) \quad \textbf{(4)}$$

$$F(\mathbf{w}) = \frac{1}{2}\left[\boldsymbol{x} - \sum_{l=0}^{L} w_l n_{k-l} \right]^2 \quad \textbf{(5)}$$

$$\frac{dw_l}{dt} = \eta[\boldsymbol{x} - \sum_{i=0}^{L} w_l n_{k-l}]n_{k-l} \quad \textbf{(6)}$$

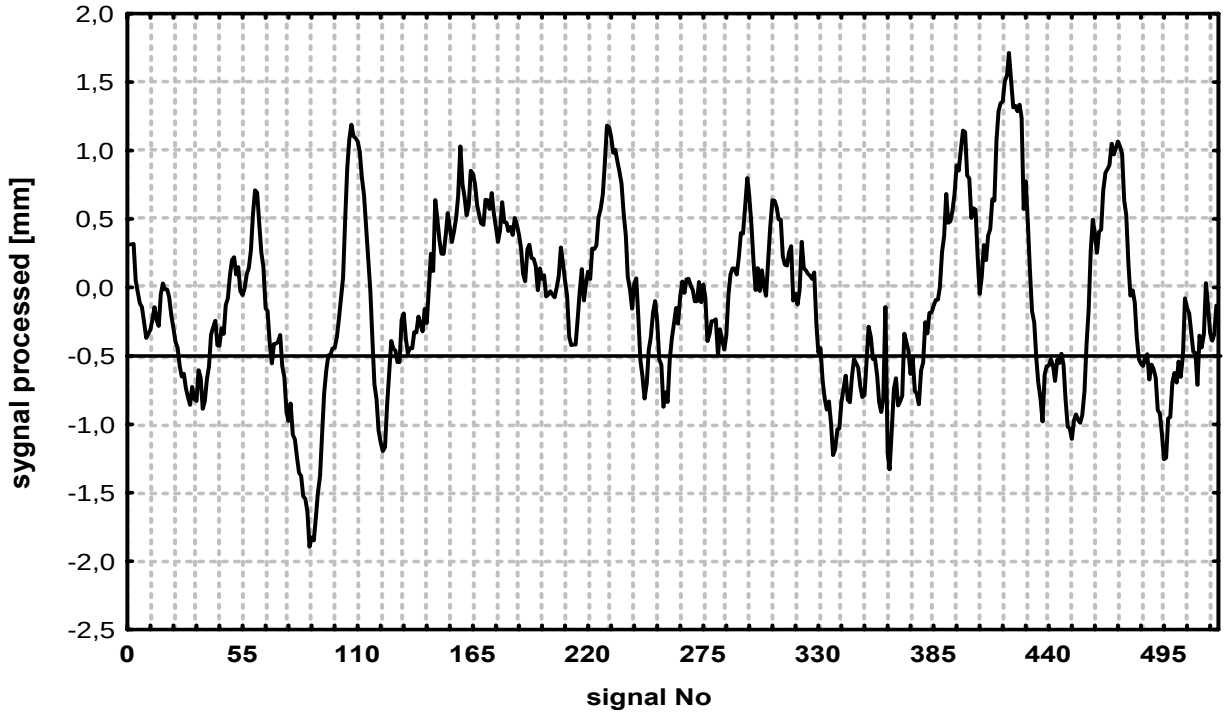
2,0
1,5
1,0
0,5
0,0
-0,5
-1,0
-1,5
-2,0
-2,5
sygnal processed [mm]
0
55
110
165
220
275
330
385
440
495
signal No

Fig. 3

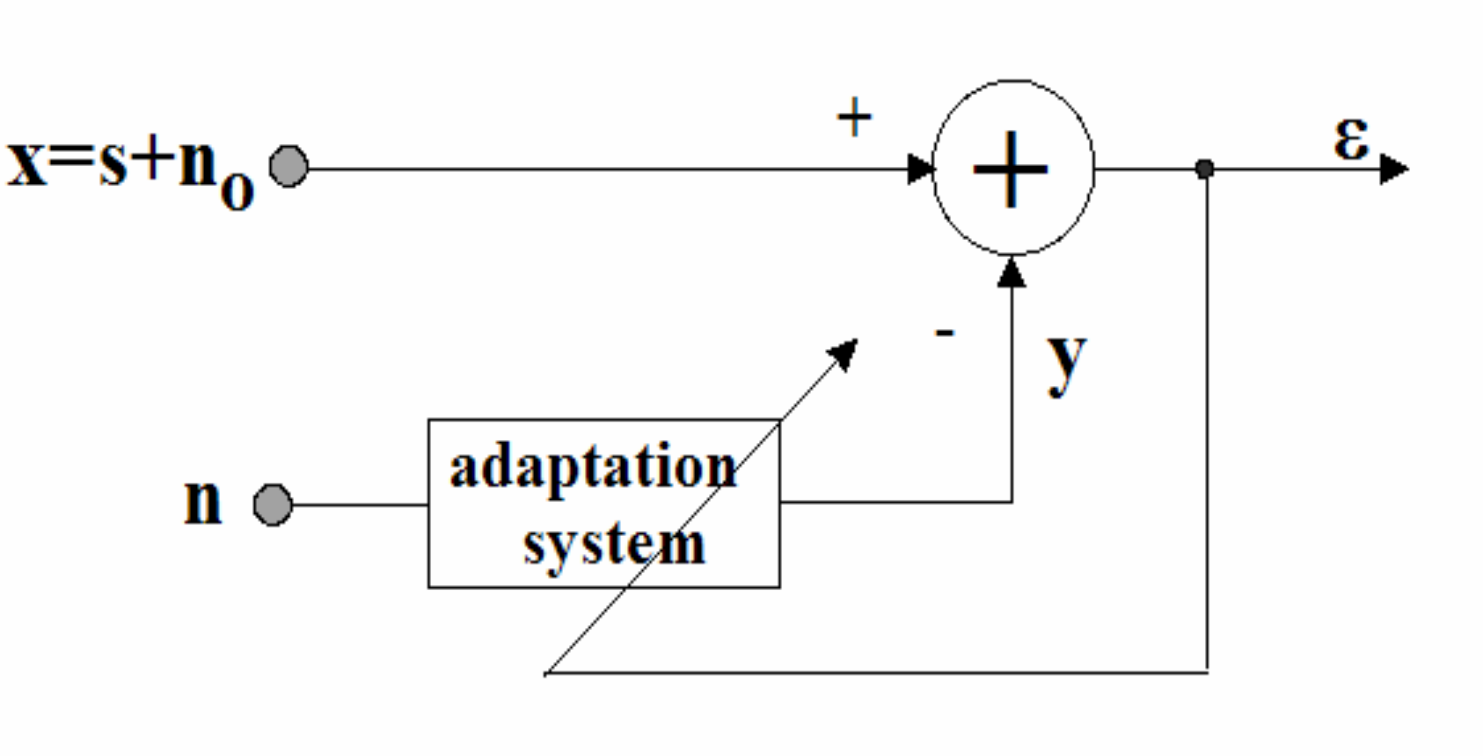

Fig. 4

$$F(\mathbf{w}) = \frac{1}{2}[\mathbf{d}(n) - \sum_{i=1}^{L} w_l x(n-l)]^2 \qquad \textbf{(7)}$$

$$\frac{dw_l}{dt} = \boldsymbol{\eta}\boldsymbol{\varepsilon}(n)\boldsymbol{x}(n-l) \qquad \textbf{(8)}$$

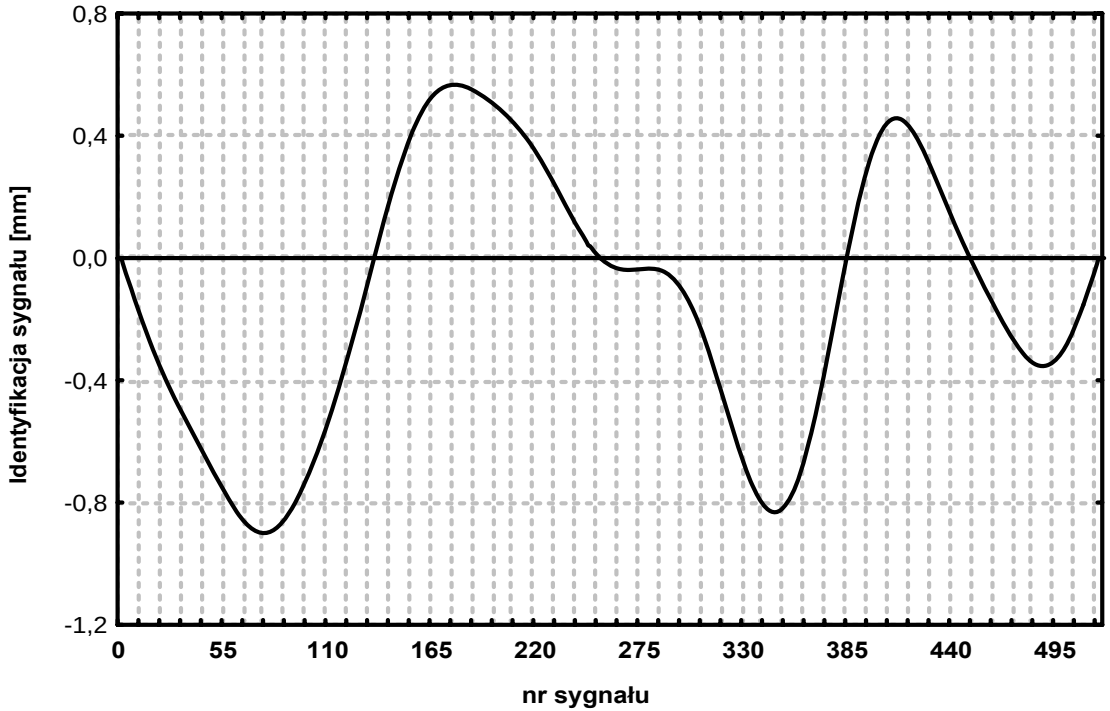
0,8
0,4
0,0
-0,4
-0,8
-1,2
Identyfikacja sygnału [mm]
0
55
110
165
220
275
330
385
440
495
nr sygnału

Fig. 5