DWT v maticovom tvare.

Rozklad(analýza): $c_{m+1}(n) = \sum_k \tilde{h}_{mr}(k-2n)c_m(k)$ $\qquad d_{m+1}(n) = \sum_k \tilde{g}_{mr}(k-2n)c_m(k)$

Rekonštrukcia(syntéza): $c_m(n) = \sum_k h_{mr}(n-2k)c_{m+1}(k) + \sum_k g_{mr}(n-2k)d_{m+1}(k)$

Tieto vzťahy môžeme prepísať do maticového tvaru ako transformácie:

$$\begin{pmatrix} \mathbf{C}_{m+1} \\ \mathbf{D}_{m+1} \end{pmatrix} = \mathbf{T}_s \mathbf{C}_m \qquad \mathbf{C}_m = \mathbf{T}_s \begin{pmatrix} \mathbf{C}_{m+1} \\ \mathbf{D}_{m+1} \end{pmatrix}$$

, kde T_a , T_s sú ***štvorcové*** transformačné matice pre analýzu, resp. pre syntézu a $\mathbf{C}_m$ resp. $\mathbf{D}_m$ sú stĺpcové vektory (matice) :

$$\mathbf{C}_m = \left(c_m(0), c_m(1), \ldots, c_m(N_m - 1)\right)^T$$
$$\mathbf{D}_m = \left(d_m(0), d_m(1), \ldots, d_m(N_m - 1)\right)^T$$

kde veľkosť vektorov je:

$$N_m = 2^{-m} N_0$$

Pozn.: *v ďalšom texte budeme* $\tilde{h}_{mr}$, h_{mr} , g_{mr} , $\tilde{g}_{mr}$ *používať bez označenia ”mr“.*

Periodické rozšírenie signálu

$$\tilde{\mathbf{H}}_m = \overbrace{\begin{pmatrix} \tilde{h}(0) & \tilde{h}(1) & \dots & \dots & \dots & \tilde{h}(-1) \\ \dots & \tilde{h}(-1) & \tilde{h}(0) & \tilde{h}(1) & \dots & \dots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \dots & \dots & \dots & \tilde{h}(-1) & \tilde{h}(0) & \tilde{h}(1) \end{pmatrix}}^{N_m} \qquad \tilde{\mathbf{G}}_m = \overbrace{\begin{pmatrix} \tilde{g}(0) & \tilde{g}(1) & \dots & \dots & \dots & \tilde{g}(-1) \\ \dots & \tilde{g}(-1) & \tilde{g}(0) & \tilde{g}(1) & \dots & \dots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \dots & \dots & \dots & \tilde{g}(-1) & \tilde{g}(0) & \tilde{g}(1) \end{pmatrix}}^{N_m} \left.\vphantom{\begin{pmatrix}a\\a\\a\\a\end{pmatrix}}\right\} \frac{N_m}{2}$$

$$\mathbf{H}_m = N_m \left\{ \begin{pmatrix} h(0) & \vdots & \dots & \vdots \\ h(1) & h(-1) & \dots & \vdots \\ \vdots & h(0) & \dots & \vdots \\ \vdots & h(1) & \dots & h(-1) \\ \vdots & \vdots & \dots & h(0) \\ h(-1) & \vdots & \dots & h(1) \end{pmatrix} \right. \qquad \mathbf{G}_m = N_m \left\{ \begin{pmatrix} g(0) & \vdots & \dots & \vdots \\ g(1) & g(-1) & \dots & \vdots \\ \vdots & g(0) & \dots & \vdots \\ \vdots & g(1) & \dots & g(-1) \\ \vdots & \vdots & \dots & g(0) \\ g(-1) & \vdots & \dots & g(1) \end{pmatrix} \right.$$

Analýza: $\mathbf{C}_{m+1} = \tilde{\mathbf{H}}_m \mathbf{C}_m \qquad \mathbf{D}_{m+1} = \tilde{\mathbf{G}}_m \mathbf{C}_m$

$$\begin{pmatrix} \mathbf{C}_{m+1} \\ \mathbf{D}_{m+1} \end{pmatrix} = \begin{pmatrix} \tilde{\mathbf{H}}_m \\ \tilde{\mathbf{G}}_m \end{pmatrix} \mathbf{C}_m \qquad \rightarrow \qquad \mathbf{T}_a = \begin{pmatrix} \tilde{\mathbf{H}}_m \\ \tilde{\mathbf{G}}_m \end{pmatrix}$$

Syntéza: $\mathbf{C}_m = \begin{pmatrix} \mathbf{H}_m & \mathbf{G}_m \end{pmatrix} \begin{pmatrix} \mathbf{C}_{m+1} \\ \mathbf{D}_{m+1} \end{pmatrix} \qquad \rightarrow \qquad \mathbf{T}_s = \begin{pmatrix} \mathbf{H}_m & \mathbf{G}_m \end{pmatrix}$