Comments on "A New Algorithm to Optimize Barker Code Sidelobe Suppression Filters"

In the above paper [1] Hua and Oksman present a simple approach to suppressing Barker code compression sidelobes. It consists of approximating an inverse filter in a finite series of terms with unknown coefficients. The coefficients are then determined by a simplex solution to an appropriate linear programming problem.

The results are correct, but the steps along the way contain two errors that compensate each other. The basic error is in (8). This leads to errors in (4c), (5), (6), and (7). However, (9) is correct.

Equation (8) should read

$$\frac{\sin(2\pi fNT)}{\sin(2\pi fT)} \leftrightarrow \sum_{n=-(N-1)/2}^{(N-1)/2} \delta(t-2nT). \tag{8'}$$

This will yield for (4c)–(7),

$$E_S = N+1-\frac{\sin(2\pi fNT)}{\sin(2\pi fT)} \tag{4c'}$$

$$H(f) = \frac{1}{E_S(f)} = \frac{1}{N+1-\dfrac{\sin(2\pi fNT)}{\sin(2\pi fT)}} \tag{5'}$$

$$\frac{1}{N+1}\frac{\sin(2\pi fNT)}{\sin(2\pi fT)} < 1 \tag{6'}$$

$$H(f) \approx A + B\frac{\sin(2\pi fNT)}{\sin(2\pi fT)} + C\left(\frac{\sin(2\pi fNT)}{\sin(2\pi fT)}\right)^2 + D\left(\frac{\sin(2\pi fNT)}{\sin(2\pi fT)}\right)^3. \tag{7'}$$

In addition, I note the following.

1) Examination of (9) shows a delta function at $t = 0, \pm 2, \pm 4, \ldots$. Thus the statement following (9) that "... $h(t)$ is a delta function sequence and can be sampled every T seconds" is confusing and should read "... sampled every $2T$ seconds."

2) Equation (12b) does not show the same right-hand sides as does (1b). This is a simple matter of scaling, but those unfamiliar with linear programming may be confused.

HARRY URKOWITZ
GE Aerospace
MS 108-130
Moorestown, NJ 08057

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REFERENCES

[1] Hua, C. X., and Oksman, J. (1990)
A new algorithm to optimize Barker code sidelobe suppression filters.
IEEE Transactions on Aerospace and Electronic Systems, **26** (July 1990), 673–677.

Author's Reply

We apologize that there are some written errors in our published paper [1]. The corrections are given as follows.

The statements on p. 675, "$h(t)$ is a delta function sequence and can be sampled every T seconds" should be corrected as "... sampled every $2T$ seconds."

The equations (4b), (4c), (5), (6), (7), and (8)

$$E_m(f) = \left(\frac{\sin(\pi fT)}{\pi fT}\right)^2 \tag{4b}$$

$$E_S(f) = N+1-\frac{\sin(2\pi fNT)}{2\pi fT} \tag{4c}$$

$$H(f) = \frac{1}{E_S(f)} = \frac{1}{N+1-\dfrac{\sin(2\pi fNT)}{2\pi fT}} \tag{5}$$

$$\frac{1}{N+1}\frac{\sin(2\pi fNT)}{2\pi fT} < 1 \tag{6}$$

$$H(f) \approx A + B\frac{\sin(2\pi fNT)}{2\pi fT} + C\left(\frac{\sin(2\pi fNT)}{2\pi fT}\right)^2 + D\left(\frac{\sin(2\pi fNT)}{2\pi fT}\right)^3 \tag{7}$$

and

$$\frac{\sin(2\pi fNT)}{2\pi fT} \Leftrightarrow \sum_{n=-(N-1)/2}^{(N-1)/2} \delta(t-2nT) \tag{8}$$

should be corrected as

$$E_m(f) = T\left(\frac{\sin(\pi fT)}{\pi fT}\right)^2 \tag{4b'}$$

$$E_S(f) = N+1-\frac{\sin(2\pi fNT)}{\sin(2\pi fT)} \tag{4c'}$$

$$H(f) = \frac{1}{E_S(f)} = \frac{1}{N+1-\dfrac{\sin(2\pi fNT)}{\sin(2\pi fT)}} \tag{5'}$$

$$\frac{1}{N+1}\frac{\sin(2\pi fNT)}{\sin(2\pi fT)} < 1 \tag{6'}$$

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