

Saleh, A. I.; Fahmy, M. F.; Raheem, G. A.; Fahmy, G. F.

On the design of two channel perfect construction QMF filters. (English) Zbl 1039.93042

Int. J. Circuit Theory Appl. 28, No. 3, 209-224 (2000).

Quadratic mirror filters (QMF) are widely used in communication technology. A QMF consists of a pair of analysis and synthesis filters. The paper addresses odd degree QMF banks with two channels with multiple poles at $z = -1$ which ensures regularity of the generated wavelet basis. The paper presents rapidly converging design methods for the FIR case and the IIR case as well. For FIR filters, it is shown that the design problem corresponds to the solution of an eigenvalue problem. For IIR filters, the proposed algorithm leads to a filter bank which can be interpreted as a generalized version of the known biorthogonal design. A version which allows combined amplitude and delay responses is also presented. All algorithms are illustrated by typical examples computed with Matlab.

Reviewer: [Rüdiger Hoffmann \(Dresden\)](#)

MSC:

[93C62](#) Digital control/observation systems

[93E11](#) Filtering in stochastic control theory

[94C05](#) Analytic circuit theory

[65T60](#) Numerical methods for wavelets

Cited in 1 Document

Keywords:

quadratic mirror filters; perfect reconstruction; equiripple approximation; eigenvalue problem; biorthogonal design

Software:

[MATHLAB](#)

Full Text: [DOI](#)

References:

- [1] Fettweis, *IEEE Transactions of ASSP* 33 pp 893– (1985)
- [2] *Multirate Systems and Filter Banks*. Prentice-Hall: Englewood Cliffs, NJ, 1993. · [Zbl 0784.93096](#)
- [3] Vaidynathan, *IEEE ASSP. Magazine* 4 pp 4– (1987)
- [4] Nguyen, *IEEE Transactions of ASSP* pp 693– (1988)
- [5] Barnwell, *IEEE Transactions on Acoustics, Speech and Signal Processing ASSP-30* pp 751– (1982)
- [6] Gockler, *IEEE Communication* 30 pp 1598– (1982)
- [7] Vetterli, *Signal Processing* 6 pp 57– (1984)
- [8] Ekanayake, *IEEE Transactions on Signal Processing* 43 pp 2313– (1995)
- [9] Tuncer, *IEEE Transactions on Signal Processing* 43 pp 544– (1995)
- [10] Andrew, *IEEE Transactions on Circuits and Systems II CAS-44* pp 754– (1997)
- [11] Nguyen, *IEEE Transaction on Signal Processing* 42 pp 2257– (1994)
- [12] Phoong, *IEEE Transactions on Signal Processing* 43 pp 649– (1995)
- [13] El-Gayed, *International Journal of Circuit Theory and Applications* 26 pp 453– (1998)
- [14] Gazsi, *IEEE Transactions on Circuits and systems CAS-32* pp 68– (1985)
- [15] An efficient design algorithm of N-band IIR digital filters: Proceedings of the 15th National Radio Science Conference NRSC'98, C-20, Egypt.
- [16] Abo-Zahhad, *International Journal of Circuit Theory and Applications* 24 pp 165– (1996) · [Zbl 0883.93055](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.