EFFICIENT MULTIBAND FILTER SYNTHESIS USING SUPER- AND CONVENTIONAL COMPUTERS

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We present a novel algebro-geometric approach [1] to multiband electric filter synthesis which allows of construction of filters with minimal possible order for a wide class of specifications including ones with large number of pass- and stopbands and ones with narrow transient bands.

This new approach is compared to Remez-type methods and to composite approach. Due to effective representation of extremal rational functions, we succeed in construction of filters admitting specifications with up to 23 pass/stopbands and with orders up to 1000, using quite modest computer facilities.

Due to special problem character, the (conventional) search for extremal functions splits to extremal problems given on disjoint classes whose number grows exponentially with the filter order. That's why the approaches more oriented on numerical optimization admit natural parallelization. However, they compete with the sequential implementation of the new approach only using hundreds of cores. Also the numerical optimization is shown to be instable for rather "complex" specifications (tens of pass/stopbands, narrow transient bands etc.).

References

[1] .B. Bogatyrev, S.A. Goreinov, S.Yu. Lyamaev, Analytical approach to multiband filter synthesis and comparison to other approaches, Problems Inform. Transmission, 53:3 (2017), 260273, arXiv: 1612.01753.