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**Review of SAW Filter Optimization Techniques
(Remez Algorithm, LP, NLP, WLMS)**

Outline

1. Chebyshev (Minimax) Approximation Problem

- 1.1. Statement of the problem
- 1.2. Properties of the Chebyshev approximation

2. Methods of the Chebyshev Approximation Problem Solution

- 2.1. Remez exchange algorithm
 - 2.1.1. Basic algorithm steps
 - 2.1.2. Algorithm features
- 2.2. Linear programming (LP)
 - 2.2.1. Statement of the LP problem
 - 2.2.2. Discrete Chebyshev approximation
 - 2.2.3. Conversion of the minimax problem to the standard LP form
 - 2.2.4. Merits of the linear programming
- 2.3. Weighted Least Mean Squares (WLMS) Technique
 - 2.3.1. Advantages of the WLMS
 - 2.3.2. WLMS problem and solution
 - 2.3.3. Example of LMS SAW filter design (fixed weighting)
 - 2.3.4. WLMS weighting schemes and algorithm convergence

2.4. Non-linear programming

2.4.1. Chebyshev approximation of the specified magnitude and phase (group delay) response

2.4.2. Non-linear phase design example

2.5. Computational speed of optimization algorithms

2.5.1. Test filter specifications

2.5.2. Comparison of the optimization time

3. SAW Filter Optimization

3.1. Chebyshev approximation problem for SAW filters

3.2. Optimum solution

3.3. Features of the optimum solution

3.4. Example of the optimum SAW filter synthesis

3.5. Properties of SAW transducer frequency response

3.5.1. Trigonometric representation

3.5.2. Symmetry and periodicity

4. Suboptimality: Parameter Number Reduction Methods

4.1. Frequency sampling

4.2. Reduction of the frequency samples number

4.3. Time domain sampling

5. Conclusions