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Parametrically Tunable Audio Shelving And Equalizing Ladder Wave Digital Filters

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**Abstract:** Parametrically tunable audio equalizers are conventionally realized using allpass digital filter networks. They consist of first-order shelving filters and second-order equalizing filters. In this paper, ladder wave digital filters (WDFs) with parametrically tunable coefficients are proposed as shelving and equalizing filters. Similar to the allpass realization, the transfer function power complementary property of WDFs is used to obtain efficient shelving and equalizing filters. However, unlike the allpass structures, the transfer function and the tunable parameters of the ladder WDF are derived from the analog filter equivalent of the digital shelving and equalizing filters. For the shelving WDF, the cut-off frequency and gain are tunable, while for the equalizing WDF, the tunable parameters are the center frequency, 3-dB bandwidth and gain. The transfer functions are derived and shown in terms of the tunable coefficients for both the shelving and equalizing WDFs.

**Key Words:** Tunable parameters, audio shelving filters, equalizing filters, wave digital filters

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