

# Design and Realization of Quadrature Mirror Hilbert Transformers Using Even-Order Elliptic IIR Filters

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## Abstract

Signals in a two-channel quadrature mirror filter bank are decomposed into low and high frequency components. Similarly, analytic signals can be extracted from the original signals with only positive or negative frequency contents. Multirate systems based on this idea are called the quadrature mirror Hilbert transformers. Previous researches on this subject ignore the case of even-order IIR filters. In this work, we investigate the quadrature mirror Hilbert transformers with even-order elliptic IIR filters. It is found that the distortion transfer function is a Hilbert transformer and the amplitude distortion can not be eliminated completely. Nevertheless, a design example shows that the distortion transfer function is very close to an allpass filter. System structures including polyphase realization are provided.

Keyword : Quadrature mirror filter bank, complex half-band filter, Hilbert transformer, elliptic IIR filter.