

Two-channel perfect reconstruction filter banks using Hilbert transformers

蔡啟明

Electrical Engineering

Engineering

tsai@chu.edu.tw

Abstract

Applying a 90-degree frequency shift to the original two-channel quadrature mirror filter bank (QMFB) yields an equivalent system with two complex half-band filters. Since their coefficients are complex conjugate to each other, one can be removed. The retained filter is a combination of an identity system and a Hilbert transformer, therefore the system is called the quadrature mirror Hilbert transformer (QMHT). However, a perfect reconstruction QMFB is designed by decomposing a zero phase half-band filter into a pair of conjugate mirror filters. The related QMHT is obtained by applying the frequency shift to the zero phase half-band filter before the decomposition. This work establishes the relationship between QMFB and QMHT for systems with perfect reconstruction. For a given QMFB, filter specifications and the design procedure for the QMHT are investigated.

Keyword : filter bank, half-band filter, Hilbert transformer, perfect reconstruction