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SURVEY ARTICLE

Literature Survey on Applications of Digital Signal Processing using Anti-Aliasing and Anti-Imaging Filters

S.Arun Kumar. M.E., (PhD)
Associate Professor,
Department Electronics and Communication Engineering,
PSNA College of Engineering and Technology, Dindigul 624 622
murphy_arun@yahoo.co.in

Abstract

The polynomial-based interpolation is that it can be efficiently implemented using the so called Farrow structure. This discrete-time filter structure consists of Finite Impulse Response (FIR) branch filters having fixed coefficient values. The interpolated samples are obtained by weighting the output samples of these FIR filters by the fractional interval m. In this paper, a new method for designing polynomial based interpolation filters has been proposed in this method is based on the relationship between the Taylor series of the approximating continuous-time signal and the Farrow structure as introduced. It enables us to design the FIR filters in the Farrow structure separately. Because these FIR filter are linear-phase filters, they can be easily designed by using the Remez algorithm.

Keywords: ***Anti-aliasing, Anti-imaging, linear-phase filters, Remez algorithm***

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Introduction:

Filters based on Taylor series used in receiver of software defined radio:

Super heterodyne Receiver The conventional super-heterodyne receiver has very good performance due in part to its discrete Components has been demonstrated in [3]. It uses an external image reject (IR) filter and an external, narrow-band, IF channel filter within the receive path [2]. A design technique for Multi-rate filters Polyphase Channelization is essential for a variety of applications involving bandwidth reduction and signal separation [3-4]. Filter level reconfigurability can be achieved by dynamically changing the interpolation and decimation factors M and D respectively of the modal filter, to extract channels of different bandwidths. Polyphase decomposition results in reduction of computation complexity in FIR filter realization [5].

Two-Stage Sharpened Comb Decimator:

The recursive structure, proposed in [2], also known as the cascaded integrator-comb (CIC) filter, consists of two main sections: an integrator section and a differentiator section separated by a down-sampler. Each of the main sections is a cascade of identical filters. It should be noted that while the differentiator section operates at the lower data rate, the integrator sections works at the higher input data rate resulting in a larger chip area and a higher power consumption especially when the decimation factor and the filter order are high.

The nonrecursive structure is realized by cascading $\log_2 M$ identical filters $\left(1+z^{-1}\right)^K$ each down-sampled by a factor of 2 [3]–[8]. The use of the nonrecursive structure reduces the power consumption and increases the circuit speed, especially when the decimation factor and the filter order are high. As a reduction of the sampling rate at an early stage helps in the reduction of the workload and power consumption, a polyphase decomposition is usually applied to realize the nonrecursive section [6]. A multistage polyphase structure with maximum decimation factor in the first stage has been recently proposed [7]. As shown there, a proper choice of the first stage decimation factor can considerably improve the power consumption, area, and maximum sampling frequency. Over sampled filter banks are used to minimize aliasing by reducing the number of significant aliasing terms [8], [16]. Digital interpolation filters are often referred to as filters with adjustable fractional delay and are widely used in symbol timing recovery block [14][15][16].

Interpolated Mth-Band Filters for Image Size Conversion:

In [17], only a half-band filter is stored in a memory, and the M th-band filters are calculated by using cosine modulation. However, the calculated filters have rather poor stop-and attenuations. Scaled images are degraded by unwanted artifacts unless they are prefiltered d equalized. The pre-filtering is not a very attractive solution, especially when dealing with video sequences. The pre-filtering of each and every frame of video sequences increases the computational complexity significantly.

Decimation Filter for Multi standard Wireless Transceivers:

A decimation filter to be used in wideband radio-frequency wireless systems. A decimation filter cascade structure is designed to meet the GSM and DECT standards specifications [18], [19] and to be very efficient computationally. Since the computation power depends on the filter order and this one depends on the filter specifications, the authors propose a practical method to look for relaxed filter specifications that take into consideration multistage structure.

Decimator for Alias Removal in Multi-ate DSP Applications:

Interpolators and decimators are utilized to increase or decrease the sampling rate [20]. For example, in digital audio three different sampling rates are used like 32 KHz for broadcasting, 44.1 KHz for digital CD and 48 KHz for digital audio tape. In video applications, the sampling rates of NTSC and PAL are 14.318 MHz and 17.734 MHz respectively. Down sampler is basic sampling rate alteration device used to decrease the sampling rate by an integer factor [21].

Conclusions:

Aliasing and imaging errors are removed by Taylor series and Farrow structure method. Better sampling rates achieved by audio and video applications. Polynomial filters are used to improve the efficiency of multirate digital signal processing.

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