FIR and IIR

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COMPARISON BETWEEN FIR AND IIR

Sl. No.	**Finite Impulse Response Filter**	**Infinite Impulse Response Filter**
1	The impulse response of the filter is restricted to finite number of samples.	The impulse response of the filter extends over an infinite duration.
2	$y(n)=b_0x(n)+b_1x(n-1)+\ldots+b_Mx(n-M)$	$y(n)=(1/a_0)[b_0x(n)+b_1x(n-1)+\ldots+b_Mx(n-M)-a_1y(n-1)-\ldots-a_Ny(n-N)$
3	$Y(z)=\sum_{k=0}^{M} b_k X(z) z^{-k}$	$Y(z)=\frac{\sum_{k=0}^{M} b_k X(z) z^{-k}}{\sum_{k=0}^{N} a_k Y(z) z^{-k}}=\frac{\sum_{k=0}^{M} b_k X(z) z^{-k}}{1+\sum_{k=1}^{N} a_k Y(z) z^{-k}}$
4	$H(z)=\sum_{k=0}^{M} b_k z^{-k}$	$H(z)=\frac{\sum_{k=0}^{M} b_k z^{-k}}{\sum_{k=0}^{N} a_k z^{-k}}=\frac{\sum_{k=0}^{M} b_k z^{-k}}{1+\sum_{k=1}^{N} a_k z^{-k}}$

5	Non – recursive	Recursive
6	High selectivity and stability – poles are fixed at the origin	Cannot be said
7	No feedback – errors due to round off noise are less severe	Round off noise is more
8	FIR filters can have precisely linear	IIR filters do not have linear phase
9	Filters are implemented by direct digital method	Filters are first implemented in analog domain then converted into digital
10	Most of the design methods are iterative procedures – which requires powerful computational facilities for their implementation.	These filters can be designed using simple calculator and tables of analog filter design parameters

11	Simple and easy to implement	Difficult to implement
12	Greater flexibility to control the shape of their magnitude response.	Less flexibility specially for obtaining non – standard frequency responses
13	<u>Design methods:</u> Fourier series method Window methods Frequency sampling method Optimum equiripple approximation	<u>Filter types:</u> Butterworth, Chebyshev (type I and II) <u>Design (Analog to Digital) methods:</u> Impulse invariant method Bilinear Transformation method Matched Z – Transformation Approximation of derivatives
14	<u>Realization techniques:</u> Direct form / Transversal structure Cascade form Linear phase realization Lattice structure Polyphase realization	<u>Realization techniques:</u> Direct form I & II Transposed direct form structure Cascade form Lattice structure Parallel form