Re: Why Bessel?

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- *From*: "Kevin Aylward" <see_website@xxxxxxxxxxxxx>
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Don Lancaster wrote:

> Roger Bourne wrote:
>
> > Hello all,
> >
> > I recently was going over an old electronic design, and I noticed that the designer used a 4rth order Bessel low pass filter where low pass filtering was needed. (I know it was a Bessel filter because it so marked ;)). The bessel filter was realized with 2 op−amps and many resistors and a few capacitors. Knowing the designer (designer is overseas now for a few years...) was always making his designs as compact as possible, − (had to twist both of to his arms to make him insert failsafe redundancies :)) − why would he use such a bulky method for low pass filtering?
> > The bessel low pass filter cuttoff frequency is ~100Hz. It's sharpness would have to be, hmmm, well pretty sharp. After all it was initially intended for a medical application. I would hazard a guess that is what warrants the 4rth order. But why a Bessel topology? I know bessel filters are usefull in audio applications because of the linear phase property they have, but this is not an audio application. Basically, I am asking why Bessel ? Does Bessel have anything special that I am anaware of?
> >
> > −Roger
>
> A Bessel filter offers the lowest possible time delay and group delay distortion.

Err.. no it doesn't. Your statement is actually a bit vague.

The Bessel filter is a filter invented to produce a linear phase with frequency (or constant delay) that actually has an *explicit* mathematical method available to calculate its element values. This is a key, fundamental point for all of the standard filters. The ability to actually be able to mathematically calculate component values of a filter of arbitrary order with some explicit procedure.

If one uses other computer techniques, not available when "modern filter theory" was being invented, such as brute force least squares fitting it is strait forward to design filters with better performance then pretty much any of the standards such as chebychev, Butterworth, Bessel etc.

For example, the Q=2/pi 2nd order is a "better" least mean squares fit to a linear phase response, i.e. better than the Bessel filter of 2nd order.

> Its falloff rate is an utter atrocity.

Since it wasn't designed to be a frequency filter this is not surprising. The fact that it rolls off at all is incidental to its initial invention.

Kevin Aylward B.Sc.
431infoEXTRACT@xxxxxxxxxxxxx
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SuperSpice, a very affordable Mixed−Mode
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"There are none more ignorant and useless,than they that seek answers on their knees, with their eyes closed"

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