Claims

1. Apparatus for processing an audio signal having associated therewith a pitch lag information and a gain information, comprising:

a domain converter ~~(100)~~ for converting a first domain representation of the audio signal into a second domain representation of the audio signal; and

a harmonic post-filter ~~(104)~~ for filtering the second domain representation of the audio signal, wherein the post-filter is based on a transfer function comprising a numerator and a denominator, wherein the numerator comprises a gain value indicated by the gain information, and wherein the denominator comprises an integer part of a pitch lag indicated by the pitch lag information and a multi-tap filter depending on a fractional part of the pitch lag.

2. Apparatus of claim 1, wherein the transfer function of the post-filter comprises, in the numerator, a further multi-tap FIR filter for a zero fractional part of the pitch lag.

3. Apparatus of claim 1 or 2, wherein the denominator comprises a product between the multi-tap filter and the gain value.

4. Apparatus of one of the preceding claims, wherein the numerator furthermore comprises a product of a first scalar value and a second scalar value, wherein the denominator comprises the second scalar value and not the first scalar value, wherein the first and second scalar values are predetermined and have values greater than 0 and lower than, and wherein the second scalar value is lower than the first scalar value.

5. Apparatus of claim 4, further comprising:

a filter controller ~~(114)~~ configured for setting the second scalar value depending on a bitrate, by which the frequency-time converter ~~(100)~~ is operated, wherein the second scalar value is set to a first value, when the bitrate has a first value, wherein the second scalar value is set to a second value, when the bitrate has a second value, wherein the second value of the bitrate is lower than the first value

of the bitrate, and wherein the second value of the second scalar value is greater than the first value of the second scalar value.

6. Apparatus ~~in accordance with~~of claim 4 or 5, wherein the first scalar value is set between 0.6 and 1.0 and wherein the second scalar value is set between 0.1 and 0.5.

7. Apparatus of one of the preceding claims,

wherein the post-filter has the transfer function H(z) in a pole-zero representation based on the following equation:

$$H(z) = \frac{1 - \alpha\beta g B(z,0)}{1 - \beta g B(z,T_{fr}) z^{-T_{int}}}$$

wherein α is a first scalar value, wherein β is a second scalar value, wherein B(z,0) is a multi-tap filter for a zero fractional part pitch lag, wherein $B(z,T_{fr})$ is a multi-tap filter depending on the fractional part of the pitch lag, wherein T_{int} is the integer part of the pitch lag, wherein T_{fr} is the fractional part of the pitch lag, and wherein *g* is the gain value indicated by the gain information z is a variable in a z-plane.

8. Apparatus of one of the preceding claims, wherein the multi-tap filter is a finite impulse response (FIR) filter and has at least three taps.

9. Apparatus of one of the preceding claims,

wherein the multi-tap filter in the denominator comprises four taps, wherein, for a zero fractional part, the first tap is between 0.0 and 0.1, the second tap is between 0.2 and 0.3, the third tap is between 0.5 and 0.6, and the fourth tap is between 0.2 and 0.3,

wherein the multi-tap filter comprises, for a first fractional part, four filter taps, wherein the first tap is between 0.0 and 0.1, the second tap is between 0.3 and 0.4, the third tap is between 0.45 and 0.55, and the fourth tap is between 0.1 and 0.2,

wherein the multi-tap filter comprises, for a second fractional part, four filter taps, wherein the first tap is between 0.0 and 0.1, the second tap is between 0.35 and 0.45, the third tap is between 0.35 and 0.45, and the fourth tap is between 0.0 and 0.1,

wherein the multi-tap filter comprises, for a third fractional part, four filter taps, wherein the first tap is between 0.1 and 0.2, the second tap is between 0.45 and 0.55, the third tap is between 0.3 and 0.4, and the fourth tap is between 0.0 and 0.1,

wherein the third fractional part is greater than the second fractional part, and wherein the second fractional part is greater than the first fractional part.

10. Apparatus of one of the preceding claims,

wherein the post-filter is configured to have a negative spectral tilt for compensating a loss in energy by the harmonic post-filter, or

wherein the post-filter is configured to suppress an amount of energy between harmonics in a frame, wherein the amount of energy suppressed is smaller than 20% of a total energy of the time-domain representation in the frame.

11. Apparatus of one of preceding claims,

wherein the domain converter is a frequency-time converter, wherein the first domain is a frequency domain and the second domain is a time domain, or

wherein the domain converter is an LPC residual-time converter, wherein the first domain is an LPC residual domain and the second domain is a time domain.".

12. Method of processing an audio signal having associated therewith a pitch lag information and a gain information, comprising:

converting ~~(100)~~ a frequency representation of the audio signal into a time-domain representation of the audio signal; and

filtering the time-domain representation of the audio signal by a harmonic post-filter ~~(104)~~, wherein the post-filter is based on a transfer function comprising a

numerator and a denominator, wherein the numerator comprises a gain value indicated by the gain information, and wherein the denominator comprises an integer part of a pitch lag indicated by the pitch lag information and a multi-tap filter depending on a fractional part of the pitch lag.

13. System for processing an audio signal comprising an encoder for encoding an audio signal and a decoder comprising a processor, the processor comprising:

a domain converter ~~(100)~~ for converting a frequency representation of the audio signal into a time-domain representation of the audio signal; and

a harmonic post-filter ~~(104)~~ for filtering the time-domain representation of the audio signal,

wherein the post-filter is based on a transfer function comprising a numerator and a denominator, wherein the numerator comprises a gain value indicated by a gain information, and wherein the denominator comprises an integer part of a pitch lag indicated by a pitch lag information and a multi-tap filter depending on a fractional part of the pitch lag.

14. System of claim 13, wherein the encoder comprises a pitch lag calculator ~~(402, 404, 406)~~ for calculating an integer part and a fractional part of the pitch lag and a gain calculator ~~(410, 412)~~ for calculating the gain value, and an encoded signal former ~~(414)~~ for generating an encoded signal ~~(102)~~ comprising the pitch lag information and the gain information.

15. Method of processing an audio signal comprising a method of encoding an audio signal and a method of decoding comprising:

converting ~~(100)~~ a frequency representation of the audio signal into a time-domain representation of the audio signal; and

filtering the time-domain representation of the audio signal using a harmonic post-filter ~~(104)~~, wherein the post-filter is based on a transfer function comprising a numerator and a denominator, wherein the numerator comprises a gain value indicated by a gain information, and wherein the denominator comprises an integer

part of a pitch lag indicated by a pitch lag information and a multi-tap filter depending on a fractional part of the pitch lag.

16. Computer program for performing a method of claim 12 or claim 15, when the computer program is running on a computer or a processor.