CLAIMS

1. A method for processing an audio signal (400, 802) in accordance with a room impulse response (300, 804), the method comprising:

separately processing (402, 404, 406, 422, 424, 812, 816a, 816b) the audio signal (400, 802) with an early part (301, 302) and a late reverberation (304) of the room impulse response (300, 804); and

combining (418, 432, 828) the audio signal processed with the early part (414, 428, 814) of the room impulse response (300, 804) and a reverberated signal (416, 430, 826a, 826b),

wherein a transition from the early part (301, 302) to the late reverberation (304) in the room impulse response (300, 804) is determined once a correlation measure reaches a threshold,

wherein the correlation measure describes with regard to the room impulse response (300, 804) a similarity of a decay in acoustic energy including an initial state and of the decay in acoustic energy starting at a time following the initial state over a predefined frequency range,

wherein the threshold is set dependent on the correlation measure for a selected one of the early reflections (302, 602) in the early part (301, 302) of the room impulse response (300, 804), and

wherein the selected one of the early reflections is the first reflection (602).

2. The method of claim 1, wherein determining the transition comprises:

determining (500) a distribution of acoustic energy based on the room impulse response (300, 804); and;

determining (502) a plurality of correlation measures indicating for a plurality of portions of the determined distribution a correlation between the acoustic energy in

the respective portion of the determined distribution and the acoustic energy at an initial state.

3. The method of claim 2, wherein

determining the distribution comprises determining a time-frequency distribution of the acoustic energy, and

a portion of the distribution comprises a time block of a predefined length, the initial state being defined by the first one of the plurality of time blocks of the time-frequency distribution.

4. The method of claims 2 or 3, wherein determining the distribution comprises calculating the energy decay relief (*EDR*) from the room impulse response ~~(300, 804)~~.

5. The method of claim 4, wherein the *EDR* is calculated as follows:

$$E(t,\omega) = \left| \int_t^{\infty} h(\tau) e^{-j\omega\tau} d\tau \right|^2$$

where

$E(t,\omega)$ = energy decay relief,

$h(\tau)$ = room impulse response ~~(300, 804)~~,

ω = $2\pi f$.

6. The method of one of claims 3 to 5, wherein the room impulse response ~~(300, 804)~~ has a predefined effective length, and wherein determining the time-frequency distribution comprises calculating the FFT spectrum of the room impulse response ~~(300, 804)~~ using a window having a length corresponding to the effective length of the room impulse response.

7. The method of claim 6, wherein

the acoustic energy at the initial state is determined by taking the whole effective length of the room impulse response ~~(300, 804) (300, 804)~~, calculating the FFT spectrum and taking the square of the absolute values, and

the acoustic energy of a time block is determined by shifting the window by the time associated with the time block, zero-padding the windowed samples to the effective length, calculating the FFT and taking the square of the absolute values.

8. The method of one of claims 1 to 7, wherein the correlation measure is calculated as follows:

$$\rho(t) = \frac{\sum_{\omega}\left(E(1,\omega) - \bar{E}(1,\omega)\right) \cdot \sum_{\omega}\left(E(t,\omega) - \bar{E}(t,\omega)\right)}{\sqrt{\sum_{\omega}\left(E(1,\omega) - \bar{E}(1,\omega)\right)^2} \cdot \sqrt{\sum_{\omega}\left(E(t,\omega) - \bar{E}(t,\omega)\right)^2}}$$

where

$\rho(t)$ = correlation measure,

$E(1,\omega)$ = full frequency range energy decay relief at frequency f,

$\bar{E}(1,\omega)$ = mean value over all frequencies of an initial full range energy decay relief,

$E(t,\omega)$ = energy decay relief at frequency f starting a time t,

$\bar{E}(t,\omega)$ = mean value over all frequencies of the full range energy decay relief starting at time t,

ω = $2\pi f$.

9. The method of one of claims 1 to 8, wherein the threshold is determined based on a constant value and the correlation measure for the selected one of the early reflections ~~(302, 602)~~.

10. The method of claim 9, wherein the constant is 1/e, and wherein the threshold is defined as follows:

$$\rho(t) = c \cdot \rho(t_F)$$

where

$\rho(t_F)$ = correlation measure for the selected one of the early reflections ~~(302, 602)~~,

t_F = time index where the selected one of the early reflections ~~(302, 602)~~ after the direct sound ~~(300)~~ impinges,

c = the constant value that is based on $\frac{1}{e}$, e being the Euler number.

11. A non-tangible computer program product comprising a computer readable medium storing instructions which, when executed on a computer, carry out the method of one of claims 1 to 10.

12. A signal processing unit, comprising

an input for receiving an audio signal ~~(400, 802)~~;

a processor configured to process the received audio signal ~~(400, 802)~~ in accordance with a room impulse response ~~(300, 804)~~ according to the method of one of claims 1 to 10; and

an output for combining ~~(418, 432, 828)~~ the processed early part ~~(414, 428, 814)~~ of the received audio signal and the reverberated signal ~~(416, 430, 826a, 826b)~~ into an output audio signal.

13. The signal processing unit of claim 12, comprising:

an early part processor ~~(402, 404, 422, 812)~~ for processing the received audio signal ~~(400, 802)~~ in accordance with the early part ~~(301, 302, 602)~~ of the room impulse response ~~(300, 804)~~; and

a late reverberation processor ~~(406, 424, 816a,816b)~~ for processing the received audio signal ~~(400, 802)~~ in accordance with the late reverberation ~~(304)~~ of the room impulse response ~~(300, 804)~~.

14. An audio encoder for encoding an audio signal, wherein

the audio encoder is configured to process an audio signal to be encoded in accordance with a room impulse response ~~(300, 804)~~ in accordance with the method of one of claims 1 to 10.

15. The audio encoder of claim 14, wherein the audio encoder comprises a signal processing unit of claim 12 or 13.

16. An audio decoder for decoding an encoded audio signal, wherein

the audio decoder is configured to process a decoded audio signal ~~(400, 802)~~ in accordance with a room impulse response ~~(300, 804)~~ in accordance with a method of one of claims 1 to 10.

17. The audio decoder of claim 16, wherein the audio decoder comprises a signal processing unit of claim 12 or 13.

18. The audio decoder of claim 16 or 17, comprising a renderer configured to receive the decoded audio signal ~~(400, 802)~~ and to render output signals based on the room impulse response ~~(300, 804)~~.

19. The audio decoder of claim 18, wherein the renderer comprises a binaural renderer.

20. A binaural renderer, comprising a signal processing unit of claim 12 or 13.