CLAIMS:

What is claimed is:

1. A method for ~~generating~~ modifyinged Binaural Room Impulse Reponses (BRIRs) comprising:

segmenting a first BRIR into at least 2 regions, wherein the first BRIR is a BRIR for an individual generated by accessing a database comprising a candidate pool of BRIRs for a population of individuals, each BRIR in the pool indexed according to extracted biometric properties and the generation of the first BRIR determined by a matching operation applied to the extracted biometric properties;

performing a modification operation on at least one of the at least 2 regions to generate at least one modified region including a direct region corresponding to different loudspeaker acoustic properties wherein the modification operation comprises adapting different perceived loudspeaker acoustic properties and room acoustic properties from the first BRIR and wherein the modification operation includes applying a deconvolution to the direct region of the first BRIR to remove first loudspeaker effects from the direct region and convolving an impulse response for a target loudspeaker with the deconvolved direct region of the first BRIR~~digital signal processing operation on at least one of the at least 2 regions to generate at least one modified region~~; and

combining the at least one modified region and any unmodified regions of the at least two regions to form a second BRIR, wherein the second BRIR relative to the first BRIR reflects changes in the perceived loudspeaker acoustic properties and the room acoustic properties when the second BRIR is used to process an audio signal~~where no processing operation is performed to form a modified BRIR, wherein the at least one modified region corresponds to changed sound attributes for a loudspeaker- room-listener interrelationship~~.

2. The method as recited in claim 1 wherein the first BRIR is segmented into at least two of 4 regions that include a direct region, an early reflections region, a head and torso influenced region, and a late reverberation region.

3. The method as recited in claim 1 wherein the second BRIR relative to the first BRIR reflects changes in perceived loudspeaker acoustic properties~~2 wherein digital signal processing operations are performed on 2 or more of the 4 regions~~.

4. The method as recited in claim ~~2~~ 1 wherein the ~~modified~~ second BRIR is intended to mimic ~~the~~ an audio processing performed by ~~a~~ the target loudspeaker different from ~~the~~ a first loudspeaker used for the first BRIR and a target room having different dimensions than the room used for the first BRIR and the at least one modified region is generated from a corresponding region culled from the impulse response for ~~a~~ the target loudspeaker, wherein segmenting includes determining the direct region of the first BRIR.

5. The method as recited in claim 4 wherein ~~segmenting includes determining the direct region in~~ the first loudspeaker effects are deconvolved from the first BRIR and further comprising ~~applying deconvolution to the direct region of the first BRIR to remove the first loudspeaker from the direct region; and~~ convolving the impulse response for the target loudspeaker ~~response~~ with the deconvolved ~~direct region of the first~~ BRIR response for the first loudspeaker.

6. ~~The method as recited in claim 4 wherein the first loudspeaker is deconvolved from the entire BRIR and further comprising convolving the target loudspeaker response with the entire deconvolved BRIR response for the first loudspeaker.~~

~~7.~~ The method as recited in claim 4 wherein the direct region of the first BRIR ~~for the first loudspeaker~~ is replaced with ~~the corresponding~~a direct region of the BRIR for the target loudspeaker**.**

~~8~~7. The method ~~as~~ recited in claim 1 wherein the ~~modified~~ second BRIR is intended to mimic ~~the~~ an audio processing performed ~~in~~ by a target room different from a first room ~~than that~~ used for the first BRIR and at least one modified region is generated from a corresponding region ~~culled~~ derived from ~~the~~ an impulse response for the target room wherein segmenting includes determining at least one of an early reflections region and late reverberations region of the first BRIR and further comprising applying changes to at least one of an early reflections region and late reverberations region to reflect the sound characteristics of the target room.

8. The method as recited in claim 1 wherein the second BRIR corresponds to an audio processing performed in a target room different from a room corresponding to the first BRIR and at least one modified region is generated from a corresponding region culled from the impulse response for the target room.

9. The method as recited in claim 1 wherein the modification ~~steps are~~operation is optimized for cinema applications and ~~intended~~ corresponds to ~~mimic~~ changes in ~~the sound~~

~~attributes for a loudspeaker- room-listener interrelationship that are derived from changes in~~room characteristics comprising at least one of loudspeaker to listener distance; loudspeaker position; room RT60; room size, dimensions, and shapes; and room furnishings.

10. The method as recited in claim 1 wherein the modification ~~steps are~~operation is optimized for gaming applications and ~~intended~~ corresponds to ~~mimic~~ changes ~~in the sound attributes for a loudspeaker- room-listener interrelationship that are derived from changes~~ in at least one of the loudspeaker distance to listener; room RT60; room size, dimensions, and shape; room furnishings; non interior room environments; fluid property variation; body size of listener; and acoustic morphing.

11. The method as recited in claim 1 wherein the modification ~~steps are~~operation is optimized for music applications and ~~intended~~ corresponds to ~~mimic~~ changes ~~in the sound attributes for a loudspeaker- room-listener interrelationship that are derived from changes~~ in at least one of selection of the loudspeaker; room RT60; room size, dimensions, and shapes; and the loudspeaker position in relation to the room walls.

12. The method as recited in claim 11 wherein the room acoustic characteristics are matched to ~~the~~ a genre of ~~the~~ a music by selection of an RT60 room parameter value.

13. The method as recited in claim 1 wherein the segmentation of regions is based on one or more of time estimates for a start and a stop time for ~~the~~ a selected one of the at least 2 region~~s~~; an echo density estimation; and measures of interaural coherence.

14. The method as recited in claim 1 wherein the ~~modified~~ second BRIR ~~is intended to~~ mimic~~s~~ changes ~~in the sound attributes for a loudspeaker- room-listener interrelationship that are~~ derived from at least one of changes in loudspeaker distance to room walls; loudspeaker distance to listener; room size and or dimensions; room construction; and room furnishings.

15. ~~A method for generating modified Binaural Room Impulse Reponses (BRIRs) comprising:~~

~~segmenting a first BRIR into at least 2 regions;~~

~~performing a modifying operation on at least one of the at least 2 regions to generate at least one modified region; and~~

~~combining the at least one modified region and any unmodified regions where no processing operation is performed to form a modified BRIR, wherein the at least one modified~~

region corresponds to changed sound attributes for a loudspeaker- room-listener interrelationship.

16. The method as recited in claim 15 wherein the modifyication operations corresponds to one of changing the distance of the speakers relative to the listener and changing the distance of the speakers relative to the room wallsinclude at least one of truncation, ray tracing, altering the slope of the decay rate, windowing, smoothing, ramping, and full room swapping.

167. A system for modifying room or speaker characteristics for spatial audio rendering over headphones comprising:

a processor configured for:

receiving a first Binaural Room Impulse Response (BRIR) corresponding to a first loudspeaker in a first room, said first BRIR generated by accessing a database comprising a candidate pool of BRIRs for a population of individuals, each BRIR in the pool indexed according to extracted biometric properties and the generation of the first BRIR determined by a matching operation applied to the extracted biometric properties;

segmenting the first BRIR into at least 2 regions;

performing a digital signal processing operation on at least one of the at least 2 regions to generate at least one modified region including a direct region corresponding to different loudspeaker acoustic properties wherein the signal processing operation comprises adapting different perceived loudspeaker acoustic properties and room acoustic properties from the first BRIR and wherein the signal processing operation includes applying an deconvolution to the direct region of the first BRIR to remove first loudspeaker effects from the direct region and convolving an impulse response for a target loudspeaker with the deconvolved direct region of the first BRIR; and

combining the at least one modified region and the any unmodified regions of the at least 2 regions to form a modified BRIR, wherein the at least one modified region corresponds to at least one changed reflecting the perceived loudspeaker acoustic properties and the room acoustic properties, and

headphones configured for rendering audio processed using the modified BRIR

sound attributes for a loudspeaker- room-listener interrelationship.

1817. The system as recited in claim 17 16 wherein the modified BRIR is intended to mimic changes in the sound attributes for a loudspeaker- room-listener interrelationship that are

~~derived from~~ at least one of ~~changes in~~a loudspeaker selection, a loudspeaker distance to room walls; a loudspeaker distance to listener; a room ~~size and or~~ dimension~~s~~; room construction; and room furnishings.

~~19~~18. The system as recited in claim ~~17~~ 16 wherein the modified BRIR is synthesized to simulate non-room environments and further comprising:

using ~~the~~ a processor to segment the first BRIR into the at least 2 regions that include a direct region, an early reflections region, a head and torso influenced region, and a late reverberation region;

identifying and removing the late reverberations and early reflections region; and

using ray tracing to synthesize the new reverberation corresponding to the non-room environment.

19. A method for generating modified spatial audio transfer functions comprising:

generating a first spatial audio transfer function customized for an individual by accessing a database comprising a candidate pool of spatial audio transfer functions for a population of individuals, each spatial audio transfer function indexed according to extracted image based properties, said generation based on a matching operation applied to the extracted image based properties;

segmenting the first spatial audio transfer function into at least two regions;

performing a modification operation on at least one of the at least two regions to generate at least one modified region including a direct region corresponding to different loudspeaker acoustic properties wherein the modification operation comprises adapting different perceived loudspeaker acoustic properties and room acoustic properties from the first spatial audio transfer function and wherein the modification operation includes applying deconvolution to the direct region of the first spatial audio transfer function to remove first loudspeaker effects from the direct region; and convolving an impulse response for the target loudspeaker with the deconvolved direct region of the first spatial audio transfer function; and

combining the at least one modified region and any unmodified regions of the at least two regions to form a modified spatial audio transfer function, wherein the modified spatial audio transfer function has at least one change reflecting changed loudspeaker acoustic properties and room acoustic properties.

20. The method as recited in claim 19 wherein the modified spatial audio transfer function provides virtualization of a target loudspeaker having different acoustic properties than the loudspeaker used as a basis for the first spatial audio transfer function.