

CLAIMS

1. A method of processing audio content including directivity information for at least one sound source, the directivity information comprising a first set of first directivity unit
5 vectors representing directivity directions and associated first directivity gains, the method comprising:
- determining, as a count number, a number of unit vectors for arrangement on a surface of a 3D sphere, wherein the number of unit vectors relates to a desired representation accuracy;
- 10 generating a second set of second directivity unit vectors by using a predetermined arrangement algorithm to distribute the determined number of unit vectors on the surface of the 3D sphere, wherein the predetermined arrangement algorithm is an algorithm for approximately uniform spherical distribution of the unit vectors on the surface of the 3D sphere; and
- 15 determining, for the second directivity unit vectors, associated second directivity gains based on the first directivity gains of one or more among a group of first directivity unit vectors that are closest to the respective second directivity unit vector.
2. The method according to claim 1,
- 20 wherein the number of unit vectors is determined such that the unit vectors, when distributed on the surface of the 3D sphere by the predetermined arrangement algorithm, would approximate the directions indicated by the first set of first directivity unit vectors up to the desired representation accuracy; and/or
- wherein the number of unit vectors is determined such that when the unit vectors were
25 distributed on the surface of the 3D sphere by the predetermined arrangement algorithm, there would be, for each of the first directivity unit vectors in the first set, at least one among the unit vectors whose direction difference with respect to the respective first directivity unit vector is smaller than the desired representation accuracy.
- 30 3. The method according to any one of the preceding claims, wherein determining the number of unit vectors involves using a pre-established functional relationship between representation accuracies and corresponding numbers of unit vectors that are distributed on the surface of the 3D sphere by the predetermined arrangement algorithm and that

approximate the directions indicated by the first set of first directivity unit vectors up to the respective representation accuracy.

4. The method according to any one of the preceding claims, wherein determining the
5 associated second directivity gain for a given second directivity unit vector involves:

setting the second directivity gain to the first directivity gain associated with that first
directivity unit vector that is closest to the given second directivity unit vector.

5. The method according to any one of the preceding claims, wherein the
10 predetermined arrangement algorithm involves superimposing a spiraling path on the surface
of the 3D sphere, extending from a first point on the sphere to a second point on the sphere,
opposite the first point, and successively arranging the unit vectors along the spiraling path,
wherein the spacing of the spiraling path and the offsets between respective two
adjacent unit vectors along the spiraling path are determined based on the number of unit
15 vectors.

6. The method according to any one of the preceding claims, wherein determining the
number of unit vectors further involves mapping the number of unit vectors to one of
predetermined numbers, wherein the predetermined numbers can be signaled by a bitstream
20 parameter.

7. The method according to any one of the preceding claims, wherein the desired
representation accuracy is determined based on a model of perceptual directivity sensitivity
thresholds of a human listener.
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8. The method according to any one of the preceding claims, wherein the cardinality
of the second set of second directivity unit vectors is smaller than the cardinality of the first
set of first directivity unit vectors.

9. The method according to any one of the preceding claims, wherein the first and
30 second directivity unit vectors are expressed in spherical or Cartesian coordinate systems.

10. The method according to any one of the preceding claims, wherein the directivity information represented by the first set of first directivity unit vectors and associated first directivity gains is stored in the SOFA format; and/or

wherein the directivity information represented by the second set of first directivity unit vectors and associated second directivity gains is stored in the SOFA format.

11. The method according to any one of the preceding claims, wherein the method is a method of encoding the audio content and further comprises:

encoding the determined number of unit vectors together with the second directivity gains into a bitstream; and
outputting the bitstream.

12. A method of decoding audio content including directivity information for at least one sound source, the directivity information comprising a number that indicates a number of approximately uniformly distributed unit vectors on a surface of a 3D sphere, and, for each such unit vector, an associated directivity gain, wherein the unit vectors are assumed to be distributed on the surface of the 3D sphere by a predetermined arrangement algorithm, wherein the predetermined arrangement algorithm is an algorithm for approximately uniform spherical distribution of the unit vectors on the surface of the 3D sphere, the method comprising:

receiving a bitstream including the audio content;
extracting the number and the directivity gains from the bitstream; and
generating a set of directivity unit vectors by using the predetermined arrangement algorithm to distribute the number of unit vectors on the surface of the 3D sphere.

13. The method according to the preceding claim, further comprising:

for a given target directivity unit vector pointing from the sound source towards a listener position, determining a target directivity gain for the target directivity unit vector based on the associated directivity gains of one or more among a group of directivity unit vectors that are closest to the target directivity unit vector.

14. A method of decoding audio content including directivity information for at least one sound source, the directivity information comprising a first set of first directivity unit

vectors representing directivity directions and associated first directivity gains, the method comprising:

- receiving a bitstream including the audio content;
- extracting the first set of directivity unit vectors and the associated first directivity gains from the bitstream;
- determining, as a count number, a number of vectors for arrangement on a surface of a 3D sphere, wherein the number of unit vectors relates to a desired representation accuracy;
- generating a second set of second directivity unit vectors by using a predetermined arrangement algorithm to distribute the determined number of unit vectors on the surface of the 3D sphere, wherein the predetermined arrangement algorithm is an algorithm for approximately uniform spherical distribution of the unit vectors on the surface of the 3D sphere;
- determining, for the second directivity unit vectors, associated second directivity gains based on the first directivity gains of one or more among a group of first directivity unit vectors that are closest to the respective second directivity unit vector; and
- for a given target directivity unit vector pointing from the sound source towards a listener position, determining a target directivity gain for the target directivity unit vector based on the associated second directivity gains of one or more among a group of second directivity unit vectors that are closest to the target directivity unit vector.

15. The method according to claim 13 or 14, wherein determining the target directivity gain for the target directivity unit vector involves:

setting the target directivity gain to the second directivity gain associated with that second directivity unit vector that is closest to the target directivity unit vector.

16. The method according to claim 14 or claim 15 when dependent on claim 14, further comprising:

extracting an indication from the bitstream of whether the second set of directivity unit vectors should be generated; and

determining the number of unit vectors and generating the second set of second directivity unit vectors if the indication indicates that the second set of directivity unit vectors should be generated.

17. An apparatus comprising a processor adapted to perform the method according to any one of the preceding claims.

18. An apparatus for decoding audio content including directivity information for at least one sound source, the directivity information comprising a number that indicates a number of approximately uniformly distributed unit vectors on a surface of a 3D sphere, and, for each such unit vector, an associated directivity gain, wherein the unit vectors are assumed to be distributed on the surface of the 3D sphere by a predetermined arrangement algorithm, wherein the predetermined arrangement algorithm is an algorithm for approximately uniform spherical distribution of the unit vectors on the surface of the 3D sphere, the apparatus comprising a processor adapted to perform the steps of the method according to any one of claims 12, 13 or 15.

19. An apparatus for decoding audio content including directivity information for at least one sound source, the directivity information comprising a first set of first directivity unit vectors representing directivity directions and associated first directivity gains, the apparatus comprising a processor adapted to perform the steps of the method according to any one of claims 14 to 16.

20. A computer program including instructions that, when executed by a processor, cause the processor to perform the method according to any one of claims 1 to 16.

21. A computer-readable medium storing the computer program of claim 20.