CLAIMS:

1. An apparatus comprising means configured to:

receive a direction value for a time frame of an audio object;

compare, as a first comparison, a bit allocation against a threshold bit allocation value;

depending on the first comparison, either quantize the direction value for the time frame of the audio object with a quantizer according to the bit allocation, or compare, as a second comparison, the direction value for the time frame of the audio object with a direction value for a previous time frame of the audio object; and

depending on the second comparison quantize the direction value for the time frame with the quantizer according to the bit allocation and signal the second comparison.

2. The apparatus as claimed in Claim 1, wherein the means configured to depending on the second comparison quantize the direction value for the time frame with the quantizer according to the bit allocation and signal the comparison is configured to:

quantize the direction value for the time frame with the quantizer according to the bit allocation when the second comparison indicates the direction value for the time frame of the audio object is different from the direction value for the previous time frame of the audio object and set a signal flag to indicate that the direction value for the time frame differs from the direction value for the previous time frame; and

set a signal flag to indicate that the direction value for the time frame is the same as the direction value for the previous time frame when the second comparison indicates the direction value for the time frame of the audio object is the same as the direction value for the previous time frame of the audio object.

3. The apparatus as claimed in any one of Claims 1 or 2, wherein the means configured to depending on the first comparison, either quantize the direction value for the time frame of the audio object with a quantizer according to the bit allocation, or compare, as a second comparison, the direction value for the time frame of the audio object with a direction value for a previous time frame of the audio object is configured to:

quantize the direction value for the time frame of the audio object with a quantizer according to the bit allocation when the bit allocation for the quantization of the direction value is not less than the threshold bit allocation value; and

compare the direction value for the time frame of the audio object with a direction value for a previous time frame of the audio object as the second comparison when the bit allocation for the quantization of the direction value is less than the threshold bit allocation value.

4. The apparatus as claimed in any one of Claims 1 to 3, wherein the quantizer is a spherical grid quantizer, wherein the spherical grid is formed by covering the

sphere with smaller spheres, wherein the smaller spheres define the points of the spherical grid.

5. The apparatus as claimed in any one of Claims 1 to 4, wherein the direction value comprises an azimuth value and an elevation value.

6. The apparatus as claimed in Claim 5, wherein the second comparison is performed on a direction value component basis, comprising that the azimuth value of the direction value for the time frame of the audio object is compared to an azimuth value of the direction value for the previous time frame of the audio object, and that the elevation value of the direction value for the time frame of the audio object is compared to an elevation value of the direction value for the previous time frame of the audio object.

7. The apparatus as claimed in any one of Claims 1 to 6, wherein the means is further configured to:
generate a priority value for the audio object;
determine the bit allocation based on the priority value for the audio object.

8. The apparatus as claimed in Claim 7, wherein the means configured to determine the bit allocation based on the priority value for the audio object is configured to:
determine the bit allocation bits(i) based on the priority value p(i) for the audio object i according to an increasing linear or non-linear function of the priority value p(i), ensuring that the bit allocation is within a fixed domain between a minimum number of bits and a maximum number of bits.

9. The apparatus as claimed in any one of Claims 1 to 8, wherein the threshold bit allocation value is predetermined to be 8 bits.

10. The apparatus as claimed in any one of Claims 1 to 9, wherein the bit allocation is a number of bits which defines the quantization grid used to encode the direction value.

11. An apparatus comprising means configured to:
compare a bit allocation for a direction value index for a time frame of an audio object against a threshold bit allocation value;
depending on the comparison, either decode the direction value index for the time frame of the audio object with a de-quantizer according to the bit allocation, or read a state of a signal flag associated with the direction value index for the time frame of the audio object; and
depending on the state of the signal flag;
either set a quantized direction value for the time frame of the audio object to be a quantized direction value for a previous time frame of the audio object, or

decode the direction value index for the time frame of the audio object with a de-quantizer according to the bit allocation giving a quantized direction value for the time frame of the audio object and adjust an azimuth value of the quantized direction value for the time frame of the audio object in accordance with a quantization resolution of the azimuth value.

12. The apparatus as claimed in Claim 11, wherein the means configured to adjust an azimuth value of the quantized direction value for the time frame of the audio object in accordance with a quantization resolution of the azimuth value is configured to:

compare the product of the azimuth value of the quantized direction value for the time frame and an azimuth value of the quantized direction value for the previous time frame of the audio object, and when the product is greater than zero:

determine a difference between two consecutive azimuth quantization values of the de-quantizer;

when a difference between the azimuth value of the quantized direction value for the time frame and the azimuth value of the quantized direction value for the previous time frame of the audio object is greater than half the difference between two consecutive azimuth quantization values of the de-quantizer subtract the half difference between two consecutive azimuth quantization values of the de-quantizer from the azimuth value of the quantized direction value for the time frame of the audio object; and

when a difference between the azimuth value of the quantized direction value for the previous time frame and the azimuth value of the quantized direction value for the time frame of the audio object is greater than half the difference between two consecutive azimuth quantization values of the de-quantizer add the half difference between two consecutive azimuth quantization values of the de-quantizer to the azimuth value of the quantized direction value for the time frame of the audio object.

13. The apparatus as claimed in Claim 12, wherein the means configured to determine a difference between two consecutive azimuth quantization values of the de-quantizer is configured to:

divide the circumference of a circle by a number of azimuth values, where the number of azimuth values is determined by the elevation value of the quantized direction value for the time frame.

14. The apparatus as claimed in any one of Claims 11 to 13, wherein the state of the signal flag indicates one of:

a direction value for the time frame of the audio object differs from a direction value for the previous time frame of the audio object; or

a direction value for the time frame of the audio object is the same as a direction value for the previous time frame of the audio object;

15. The apparatus as claimed in any one of Claims 11 to 14, wherein the de-quantizer is a spherical grid quantizer, wherein the spherical grid is formed by covering the sphere with smaller spheres, wherein the smaller spheres define the points of the spherical grid.

16. The apparatus as claimed in any one of Claims 11 to 15, wherein the quantized direction value comprises an azimuth value and an elevation value.

17. The apparatus as claimed in any one of Claims 11 to 16, wherein the means is further configured to:
generate a priority value for the audio object;
determine the bit allocation based on the priority value for the audio object.

18. The apparatus as claimed in Claim 17, wherein the means configured to determine the bit allocation based on the priority value for the audio object is configured to:
determine the bit allocation bits(i) based on the priority value p(i) for the audio object i according to an increasing linear or non-linear function of the priority value p(i), ensuring that the bit allocation is within a fixed domain between a minimum number of bits and a maximum number of bits.

19. The apparatus as claimed in any one of Claims 11 to 18, wherein the threshold bit allocation value is predetermined to be 8 bits.

20. The apparatus as claimed in any one of Claims 11 to 19, wherein the bit allocation is a number of bits which defines the quantization grid used to decode the direction value index.

21. A method comprising:
receiving a direction value for a time frame of an audio object;
comparing, as a first comparison, a bit allocation against a threshold bit allocation value;
depending on the first comparison, either quantizing the direction value for the time frame of the audio object with a quantizer according to the bit allocation, or comparing, as a second comparison, the direction value for the time frame of the audio object with a direction value for a previous time frame of the audio object; and
depending on the second comparison quantizing the direction value for the time frame with the quantizer according to the bit allocation and signal the second comparison.

22. The method as claimed in Claim 21, wherein depending on the second comparison quantize the direction value for the time frame with the quantizer according to the bit allocation and signal the comparison comprises:

quantizing the direction value for the time frame with the quantizer according to the bit allocation when the second comparison indicates the direction value for the time frame of the audio object is different from the direction value for the previous time frame of the audio object and set a signal flag to indicate that the direction value for the time frame differs from the direction value for the previous time frame; and

setting a signal flag to indicate that the direction value for the time frame is the same as the direction value for the previous time frame when the second comparison indicates the direction value for the time frame of the audio object is the same as the direction value for the previous time frame of the audio object.

23. The method as claimed in any one of Claims 21 or 22, wherein depending on the first comparison, either quantizing the direction value for the time frame of the audio object with a quantizer according to the bit allocation, or comparing, as a second comparison, the direction value for the time frame of the audio object with a direction value for a previous time frame of the audio object comprises:

quantizing the direction value for the time frame of the audio object with a quantizer according to the bit allocation when the bit allocation for the quantization of the direction value is not less than the threshold bit allocation value; and

comparing the direction value for the time frame of the audio object with a direction value for a previous time frame of the audio object as the second comparison when the bit allocation for the quantization of the direction value is less than the threshold bit allocation value.

24. The method as claimed in any one of Claims 21 to 23, wherein the quantizer is a spherical grid quantizer wherein the spherical grid is formed by covering the sphere with smaller spheres, wherein the smaller spheres define the points of the spherical grid.

25. The method as claimed in any one of Claims 21 to 24, wherein the direction value comprises an azimuth value and an elevation value.

26. The method as claimed in Claim 25, wherein the second comparison is performed on a direction value component basis, comprising that the azimuth value of the direction value for the time frame of the audio object is compared to an azimuth value of the direction value for the previous time frame of the audio object, and that the elevation value of the direction value for the time frame of the audio object is compared to an elevation value of the direction value for the previous time frame of the audio object.

27. The method as claimed in any one of Claims 21 to 26, comprising:
generating a priority value for the audio object;
determining the bit allocation based on the priority value for the audio object.

28. The method as claimed in Claim 27, wherein the determining of the bit allocation based on the priority value for the audio object comprises:

determining the bit allocation bits(i) based on the priority value p(i) for the audio object i according to an increasing linear or non-linear function of the priority value p(i), ensuring that the bit allocation is within a fixed domain between a minimum number of bits and a maximum number of bits.

29. The method as claimed in any one of Claims 21 to 28, wherein the threshold bit allocation value is predetermined to be 8 bits.

30. The method as claimed in any one of Claims 21 to 29, wherein the bit allocation is a number of bits which defines the quantization grid used to encode the direction value.

31. A bitstream comprising, for a time frame, for each of a plurality of audio objects, a respective encoded direction value, the respective direction value being encoded according to the method of any one of Claims 21 to 30.

32. The bitstream of Claim 31, the bitstream comprising for the time frame:
- an encoded object identifier of an audio object selected from the plurality of audio objects;
- an encoded audio signal associated with the selected audio object;
- an encoded downmix formed from metadata-assisted spatial audio, MASA, transport audio signals and transport audio signals associated with non-selected objects of the plurality of objects;
- encoded MASA metadata;
- encoded MASA-to-total ratios;
- encoded independent stream with metadata, ISM, ratios determined for each object in the plurality of objects; and
- encoded object metadata for each object in the plurality of audio objects, wherein the encoded object metadata comprises the encoded direction values for the time frame.

33. A method comprising:
comparing a bit allocation for a direction value index for a time frame of an audio object against a threshold bit allocation value;
depending on the comparison, either decoding the direction value index for the time frame of the audio object with a de-quantizer according to the bit allocation, or reading a state of a signal flag associated with the direction value index for the time frame of the audio object; and
depending on the state of the signal flag;
either setting a quantized direction value for the time frame of the audio object to be a quantized direction value for a previous time frame of the audio object, or
decoding the direction value index for the time frame of the audio object with a de-quantizer according to the bit allocation giving a quantized direction value for the time frame of the audio object and adjusting an azimuth value

of the quantized direction value for the time frame of the audio object in accordance with a quantization resolution of the azimuth value.

34. The method as claimed in Claim 33, wherein adjusting an azimuth value of the quantized direction value for the time frame of the audio object in accordance with a quantization resolution of the azimuth value comprises:

comparing the product of the azimuth value of the quantized direction value for the time frame and an azimuth value of the quantized direction value for the previous time frame of the audio object, and when the product is greater than zero:

determining a difference between two consecutive azimuth quantization values of the de-quantizer;

when a difference between the azimuth value of the quantized direction value for the time frame and the azimuth value of the quantized direction value for the previous time frame of the audio object is greater than half the difference between two consecutive azimuth quantization values of the de-quantizer subtracting the half difference between two consecutive azimuth quantization values of the de-quantizer from the azimuth value of the quantized direction value for the time frame of the audio object; and

when a difference between the azimuth value of the quantized direction value for the previous time frame and the azimuth value of the quantized direction value for the time frame of the audio object is greater than half the difference between two consecutive azimuth quantization values of the de-quantizer adding the half difference between two consecutive azimuth quantization values of the de-quantizer to the azimuth value of the quantized direction value for the time frame of the audio object.

35. The method as claimed in Claim 34, wherein determining a difference between two consecutive azimuth quantization values of the de-quantizer comprises:

dividing the circumference of a circle by a number of azimuth values, where the number of azimuth values is determined by the elevation value of the quantized direction value for the time frame.

36. The method as claimed in Claims 33 to 35, wherein the state of the signal flag indicates one of:

a direction value for the time frame of the audio object differs from a direction value for the previous time frame of the audio object; or

a direction value for the time frame of the audio object is the same as a direction value for the previous time frame of the audio object.

37. The method as claimed in Claims 33 to 36, wherein the de-quantizer is a spherical grid quantizer, wherein the spherical grid is formed by covering the sphere with smaller spheres, wherein the smaller spheres define the points of the spherical grid.