CLAIMS

1. A method of encoding a point cloud captured by a spinning sensor head into a bitstream of encoded point cloud data representing a physical object, characterized in that the method further comprises:

obtaining, for each point of the point cloud, a sensor index (λ_n) associated with a sensor that captured the point of the point cloud, an azimuthal angle (ϕ_n) representing a capture angle of said sensor quantized by: ϕ_n =round($\phi(P_n)/\Delta\phi$),

where $\phi(P_n)$ is an original azimuthal angle of the point (P_n) of the point cloud and $\Delta\phi$ is an elementary azimuthal shift value; each captured point of the point cloud being represented by a radius value (r_n) associated with a point in a 2D discrete angular plane in which said sensor index (λ_n) is a coordinate of a first axis of the 2D discrete angular plane and said azimuthal angle (ϕ_n) is a coordinate of a second axis of the 2D discrete angular plane;

ordering points of the point cloud by ordering points of the 2D discrete angular plane according to a lexicographic order based first on the azimuthal angles (ϕ_n) and then on the sensor indices (λ_n) or inversely, an order index $o(P_n)$ being associated with each point (P_n) of the point cloud, said order index being defined based on the sensor index of the sensor of the spinning sensor head used for capturing the point (P_n) of the point cloud and an azimuthal angle of said sensor; and

encoding, into the bitstream, at least one order index difference (Δo_n) representing a difference between order indices ($o(P_n)$) of two consecutive ordered points;

obtaining residual azimuthal angles $\phi_{res,n}$ by: $\phi_{res,n} = \phi(P_n) - \phi_n * \Delta\phi$; and

encoding, into the bitstream, the residual azimuthal angles ($\phi_{res,n}$).

2. The method of claim 1, wherein the method further comprises encoding, into the bitstream, radius values (r_n).

3. The method of claim 2, wherein the method further comprises encoding, in the bitstream, residuals $(x_{res,n}, y_{res,n}, z_{res,n})$ of three-dimensional cartesian coordinates of ordered points based on their three-dimensional cartesian coordinates, on decoded azimuthal angles ($\phi_{dec,n}$) obtained from azimuthal angles (ϕ_n), on decoded radius values ($r_{dec,n}$) obtained from radius values (r_n), and on sensor indices (λ_n).

4. The method of claim 3, wherein the decoded azimuthal angles ($\phi_{dec,n}$) are also obtained from residual azimuthal angles ($\phi_{res,n}$) associated with ordered points, and wherein the method further comprises encoding, in the bitstream, the residual azimuthal angles ($\phi_{res,n}$).

5. A method of decoding a point cloud captured by a spinning sensor head from a bitstream of encoded point cloud data representing a physical object, each point of the point cloud being represented by a point of a 2D discrete angular plane in which sensor index is a coordinate of a first axis of the 2D discrete angular plane and azimuthal angle is a coordinate of a second axis of the 2D discrete angular plane, characterized in that the method comprises:

decoding, from the bitstream for each point (P_n) of the point cloud, an order index difference (Δo_n) representing a difference between order indices ($o(P_n)$) of two

consecutive ordered points of the point cloud, called current point (P_n) and previously decoded point (P_{n-1}); and

obtaining an order index $o(P_n)$ associated with the current point (P_n) by: $o(P_n) = o(P_{n-1}) + \Delta o_n$,

where $o(P_{n-1})$ represents an order index associated with the previously decoded point (P_{n-1});

the points of the point cloud being ordered by ordering points of the 2D discrete angular plane according to the order index $(o(P_n))$;

obtaining, for each current point (P_n) of the point cloud, a sensor index (λ_n) associated with a sensor that captured the current point (P_n) and an azimuthal angle ϕ_n representing a capture angle of said, for each point of the point cloud, a sensor index (λ_n) associated with a sensor that captured the current point (P_n) and an azimuthal angle (ϕ_n) representing a capture angle of said sensor from an order index ($o(P_n)$) associated with the current point (P_n);

decoding residual azimuthal angles $\phi_{res,n}$ from the bitstream; and

obtaining a decoded azimuthal angle $\phi_{dec,n}$ by: $\phi_{dec,n} = \phi_n * \Delta\phi + \phi_{res,n}$,

wherein $\Delta\phi$ is an elementary azimuthal shift.

6. The method of claim 5, wherein the method further comprises decoding radius values (r_n) from the bitstream and obtaining decoded radius values ($r_{dec,n}$) from the radius values (r_n).

7. The method of claim 6, wherein the method further comprises decoding, from the bitstream, residuals $(x_{res,n}, y_{res,n}, z_{res,n})$ of three-dimensional cartesian coordinates of ordered points and obtaining decoded three-dimensional cartesian coordinates (x_n, y_n, z_n) of ordered points based on their decoded azimuthal angles ($\phi_{dec,n}$) obtained from the azimuthal angles (ϕ_n), on their decoded radius values ($r_{dec,n}$) and on their sensor indices (λ_n).

8. The method of claim 7, wherein the method further comprises decoding residual azimuthal angles ($\phi_{res,n}$) from the bitstream, and wherein the decoded azimuthal angles ($\phi_{dec,n}$) are also obtained from the residual azimuthal angles ($\phi_{res,n}$).

9. An apparatus of encoding a point cloud captured by a spinning sensor head into a bitstream of encoded point cloud data representing a physical object, the apparatus comprising one or more processors configured to:

obtain, for each point of the point cloud, a sensor index (λ_n) associated with a sensor that captured the point of the point cloud, an azimuthal angle (ϕ_n) representing a capture angle of said sensor quantized by: ϕ_n =round($\phi(P_n)/\Delta\phi$),

where $\phi(P_n)$ is an original azimuthal angle of the point (P_n) of the point cloud and $\Delta\phi$ is an elementary azimuthal shift value; each captured point of the point cloud being represented by a radius value (r_n) associated with a point in a 2D discrete angular plane in which said sensor index (λ_n) is a coordinate of a first axis of the 2D discrete angular plane and said azimuthal angle (ϕ_n) is a coordinate of a second axis of the 2D discrete angular plane;

order points of the point cloud by ordering points of the 2D discrete angular plane according to a lexicographic order based first on the azimuthal angles (ϕ_n) and then on the sensor indices (λ_n) or inversely, an order index $o(P_n)$ being associated with each

point (P_n) of the point cloud, said order index being defined based on the sensor index of the sensor of the spinning sensor head used for capturing the point (P_n) of the point cloud and an azimuthal angle of said sensor; and

encode, into the bitstream, at least one order index difference (Δo_n) representing a difference between order indices ($o(P_n)$) of two consecutive ordered points;

obtaining residual azimuthal angles $\phi_{res,n}$ by: $\phi_{res,n}$ = $\phi(P_n)$ - $\phi_n * \Delta\phi$; and

encoding, into the bitstream, the residual azimuthal angles ($\phi_{res,n}$).

10. An apparatus of decoding a point cloud captured by a spinning sensor head from a bitstream of encoded point cloud data representing a physical object, each point of the point cloud being represented by a point of a 2D discrete angular plane in which sensor index is a coordinate of a first axis of the 2D discrete angular plane and azimuthal angle is a coordinate of a second axis of the 2D discrete angular plane, the apparatus comprising one or more processors configured to:

decode, from the bitstream for each point (P_n) of the point cloud, an order index difference representing a difference between order indices of two consecutive ordered points of the point cloud, called current point (P_n) and previously decoded point (P_{n-1}); and

obtain an order index $o(P_n)$ associated with the current point (P_n) by: $o(P_n) = o(P_{n-1}) + \Delta o_n$,

where $o(P_{n-1})$ represents an order index associated with the previously decoded point (P_{n-1});

the points of the point cloud being ordered by ordering points of the 2D discrete angular plane according to the order index $(o(P_n))$;

obtaining, for each current point (P_n) of the point cloud, a sensor index (λ_n) associated with a sensor that captured the current point (P_n) and an azimuthal angle ϕ_n representing a capture angle of said, for each point of the point cloud, a sensor index associated with a sensor that captured the current point (P_n) and an azimuthal angle ϕ_n representing a capture angle of said sensor from an order index associated with the current point (P_n);

decoding residual azimuthal angles $\phi_{res,n}$ from the bitstream; and

obtaining a decoded azimuthal angle $\phi_{dec,n}$ by: $\phi_{dec,n} = \phi_n * \Delta\phi + \phi_{res,n}$,

wherein $\Delta\phi$ is an elementary azimuthal shift.

11. A computer program product including instructions which, when the program is executed by one or more processors, causes the one or more processors to carry out a method of encoding a point cloud captured by a spinning sensor head into a bitstream of encoded point cloud data representing a physical object, the method comprising:

obtaining, for each point of the point cloud, a sensor index (λ_n) associated with a sensor that captured the point of the point cloud, an azimuthal angle (ϕ_n) representing a capture angle of said sensor quantized by: ϕ_n =round($\phi(P_n)/\Delta\phi$),

where $\phi(P_n)$ is an original azimuthal angle of the point (P_n) of the point cloud and $\Delta\phi$ is an elementary azimuthal shift value; each captured point of the point cloud being represented by a radius value (r_n) associated with a point in a 2D discrete angular plane in which said sensor index (λ_n) is a coordinate of a first axis of the 2D discrete angular plane and said azimuthal angle (ϕ_n) is a coordinate of a second axis of the 2D discrete angular plane;

ordering points of the point cloud by ordering points of the 2D discrete angular plane according to a lexicographic order based first on the azimuthal angles (ϕ_n) and then on the sensor indices (λ_n) or inversely, an order index $o(P_n)$ being associated with each point (P_n) of the point cloud, said order index being defined based on the sensor index of the sensor of the spinning sensor head used for capturing the point (P_n) of the point cloud and an azimuthal angle of said sensor; and

encoding, into the bitstream, at least one order index difference (Δo_n) representing a difference between order indices ($o(P_n)$) of two consecutive ordered points;

obtaining residual azimuthal angles $\phi_{res,n}$ by: $\phi_{res,n} = \phi(P_n) - \phi_n * \Delta\phi$; and

encoding, into the bitstream, the residual azimuthal angles ($\phi_{res,n}$).

12. A non-transitory storage medium carrying instructions of program code for executing a method of encoding a point cloud captured by a spinning sensor head into a bitstream of encoded point cloud data representing a physical object, the method comprising:

obtaining, for each point of the point cloud, a sensor index (λ_n) associated with a sensor that captured the point of the point cloud, an azimuthal angle (ϕ_n) representing a capture angle of said sensor quantized by: ϕ_n =round($\phi(P_n)/\Delta\phi$),

where $\phi(P_n)$ is an original azimuthal angle of the point (P_n) of the point cloud and $\Delta\phi$ is an elementary azimuthal shift value; each captured point of the point cloud being represented by a radius value (r_n) associated with a point in a 2D discrete angular plane in which said sensor index (λ_n) is a coordinate of a first axis of the 2D discrete angular plane and said azimuthal angle (ϕ_n) is a coordinate of a second axis of the 2D discrete angular plane;

ordering points of the point cloud by ordering points of the 2D discrete angular plane according to a lexicographic order based first on the azimuthal angles (ϕ_n) and then on the sensor indices (λ_n) or inversely, an order index $o(P_n)$ being associated with each point (P_n) of the point cloud, said order index being defined based on the sensor index of the sensor of the spinning sensor head used for capturing the point (P_n) of the point cloud and an azimuthal angle of said sensor; and

encoding, into the bitstream, at least one order index difference (Δo_n) representing a difference between order indices ($o(P_n)$) of two consecutive ordered points;

obtaining residual azimuthal angles $\phi_{res,n}$ by: $\phi_{res,n} = \phi(P_n) - \phi_n * \Delta\phi$; and

encoding, into the bitstream, the residual azimuthal angles ($\phi_{res,n}$).

13. A computer program product including instructions which, when the program is executed by one or more processors, causes the one or more processors to carry out a method of decoding a point cloud from a bitstream of encoded point cloud data representing a physical object, the method comprising:

decoding, from the bitstream for each point (P_n) of the point cloud, an order index difference (Δo_n) representing a difference between order indices ($o(P_n)$) of two consecutive ordered points of the point cloud, called current point (P_n) and previously decoded point (P_{n-1}); and

obtaining an order index $o(P_n)$ associated with the current point (P_n) by: $o(P_n) = o(P_{n-1}) + \Delta o_n$,

where $o(P_{n-1})$ represents an order index associated with the previously decoded point (P_{n-1});

the points of the point cloud being ordered by ordering points of the 2D discrete angular plane according to the order index $(o(P_n))$;

obtaining, for each current point (P_n) of the point cloud, a sensor index (λ_n) associated with a sensor that captured the current point (P_n) and an azimuthal angle ϕ_n representing a capture angle of said, for each point of the point cloud, a sensor index (λ_n) associated with a sensor that captured the current point (P_n) and an azimuthal angle (ϕ_n) representing a capture angle of said sensor from an order index $(o(P_n))$ associated with the current point (P_n);

decoding residual azimuthal angles $\phi_{res,n}$ from the bitstream; and

obtaining a decoded azimuthal angle $\phi_{dec,n}$ by: $\phi_{dec,n} = \phi_n * \Delta\phi + \phi_{res,n}$,

wherein $\Delta\phi$ is an elementary azimuthal shift.

14. A non-transitory storage medium carrying instructions of program code for executing a method of decoding a point cloud captured by a spinning sensor head from a bitstream of encoded point cloud data representing a physical object, each point of the point cloud being represented by a point of a 2D discrete angular plane in which sensor index is a coordinate of a first axis of the 2D discrete angular plane and azimuthal angle is a coordinate of a second axis of the 2D discrete angular plane, the method comprising:

decoding, from the bitstream for each point (P_n) of the point cloud, an order index difference (Δo_n) representing a difference between order indices ($o(P_n)$) of two consecutive ordered points of the point cloud, called current point (P_n) and previously decoded point (P_{n-1}); and

obtaining an order index $o(P_n)$ associated with the current point (P_n) by: $o(P_n) = o(P_{n-1}) + \Delta o_n$,

where $o(P_{n-1})$ represents an order index associated with the previously decoded point (P_{n-1});

the points of the point cloud being ordered by ordering points of the 2D discrete angular plane according to the order index $(o(P_n))$;

obtaining, for each current point (P_n) of the point cloud, a sensor index (λ_n) associated with a sensor that captured the current point (P_n) and an azimuthal angle ϕ_n representing a capture angle of said, for each point of the point cloud, a sensor index (λ_n) associated with a sensor that captured the current point (P_n) and an azimuthal angle (ϕ_n) representing a capture angle of said sensor from an order index $(o(P_n))$ associated with the current point (P_n);

decoding residual azimuthal angles $\phi_{res,n}$ from the bitstream; and

obtaining a decoded azimuthal angle $\phi_{dec,n}$ by: $\phi_{dec,n} = \phi_n * \Delta\phi + \phi_{res,n}$,

wherein $\Delta\phi$ is an elementary azimuthal shift.

15. An electronic device, comprising:

a processor; and

a memory for storing instructions executable by the processor;

wherein the processor is configured to encode a point cloud captured by a spinning sensor head into a bitstream of encoded point cloud data representing a physical object, wherein the processor is configured to:

obtain, for each point of the point cloud, a sensor index (λ_n) associated with a sensor that captured the point of the point cloud, an azimuthal angle (ϕ_n) representing a capture angle of said sensor quantized by: ϕ_n =round($\phi(P_n)/\Delta\phi$),

where $\phi(P_n)$ is an original azimuthal angle of the point (P_n) of the point cloud and $\Delta\phi$ is an elementary azimuthal shift value; each captured point of the point cloud being represented by a radius value (r_n) associated with a point in a 2D discrete angular plane in which said sensor index (λ_n) is a coordinate of a first axis of the 2D discrete angular plane and said azimuthal angle (ϕ_n) is a coordinate of a second axis of the 2D discrete angular plane;

order points of the point cloud by ordering points of the 2D discrete angular plane according to a lexicographic order based first on the azimuthal angles (ϕ_n) and then on the sensor indices (λ_n) or inversely, an order index $o(P_n)$ being associated with each point (P_n) of the point cloud, said order index being defined based on the sensor index of the sensor of the spinning sensor head used for capturing the point (P_n) of the point cloud and an azimuthal angle of said sensor; and

encode, into the bitstream, at least one order index difference (Δo_n) representing a difference between order indices ($o(P_n)$) of two consecutive ordered points;

obtaining residual azimuthal angles $\phi_{res,n}$ by: $\phi_{res,n} = \phi(P_n) - \phi_n * \Delta\phi$; and

encoding, into the bitstream, the residual azimuthal angles ($\phi_{res,n}$).

16. The electronic device of claim 15, wherein the processor is further configured to encode, into the bitstream, radius values (r_n).

17. The electronic device of claim 16, wherein the processor is further configured to encode, in the bitstream, residuals $(x_{res,n}, y_{res,n}, z_{res,n})$ of three-dimensional cartesian coordinates of ordered points based on their three-dimensional cartesian coordinates, on decoded azimuthal angles ($\phi_{dec,n}$) obtained from azimuthal angles (ϕ_n), on decoded radius values ($r_{dec,n}$) obtained from radius values (r_n), and on sensor indices (λ_n).

18. An electronic device, comprising:

a processor; and

a memory for storing instructions executable by the processor;

wherein the processor is configured to decode a point cloud captured by a spinning sensor head from a bitstream of encoded point cloud data representing a physical object, each point of the point cloud being represented by a point of a 2D discrete angular plane in which sensor index is a coordinate of a first axis of the 2D discrete angular plane and azimuthal angle is a coordinate of a second axis of the 2D discrete angular plane, wherein the processor is configured to:

decode, from the bitstream for each point (P_n) of the point cloud, an order index difference (Δo_n) representing a difference between order indices ($o(P_n)$) of two consecutive ordered points of the point cloud, called current point (P_n) and previously decoded point (P_{n-1}); and

obtain an order index $o(P_n)$ associated with the current point (P_n) by: $o(P_n) = o(P_{n-1}) + \Delta o_n$,

where $o(P_{n-1})$ represents an order index associated with the previously decoded point (P_{n-1});

the points of the point cloud being ordered by ordering points of the 2D discrete angular plane according to the order index $(o(P_n))$;

obtaining, for each current point (P_n) of the point cloud, a sensor index (λ_n) associated with a sensor that captured the current point (P_n) and an azimuthal angle ϕ_n representing a capture angle of said, for each point of the point cloud, a sensor index (λ_n) associated with a sensor that captured the current point (P_n) and an azimuthal angle representing a capture angle of said sensor from an order index ($o(P_n)$) associated with the current point (P_n);

decoding residual azimuthal angles $\phi_{res,n}$ from the bitstream; and

obtaining a decoded azimuthal angle $\phi_{dec,n}$ by: $\phi_{dec,n} = \phi_n * \Delta\phi + \phi_{res,n}$, wherein $\Delta\phi$ is an elementary azimuthal shift.

19. The electronic device of claim 18, wherein the processor is further configured to:

decode radius values from the bitstream and obtaining decoded radius values from the radius values (r_n).