CLAIMS

1. A computer-implemented method (100) for estimating respiratory parameters of a subject, wherein said method comprises:

- receiving a set of acquisitions derived from a range imaging sensor (Sri) comprising at least two raw images of at least one portion of a torso of the subject (110), wherein each point of the raw image represents a distance between the range imaging sensor (Sri) and the subject;
- generating a surface image of at least one portion of a surface of the torso of the subject by surface approximation of the raw image (120);
- estimating a respiratory signal as a function of time by calculating for each surface image, a spatial average, in a given region of interest (ROI) defined on the torso of the subject, of differences between depth values of said surface image at a given time and the depth values of a reference surface image, obtained from the set of acquisitions (130);
- estimating respiratory parameters including at least a lung volume as a function of time by multiplying the respiratory signal by a surface of the region of interest (140), and
- providing as output said respiratory parameters.

2. The method according to claim **1**, further comprising estimating a tidal volume as the difference between the maximum value and the minimum value in one respiratory cycle of the respiratory signal multiplied by the surface of the region of interest.

3. The method according to either one of claim **1** or **2**, further comprising estimating a respiratory rate calculated from the detection of inhalation peaks in the respiratory signal (150).

4. The method according to any one of claims **1** to **3**, wherein the surface image is obtained using basis spline functions.

5. The method according to any one of claims **1** to **4**, further comprising a step of filtering the raw image so as to remove noise originating from other object in the scene (111).

6. The method according to any one of claims **1** to **5**, wherein the raw images are derived from the range imaging sensor being a time-of-flight (ToF) camera.

7. The method according to claim **6**, wherein the method further comprises a calibration step applying a rotation matrix to the raw image so as to align the subject torso in the raw image with the *xy* plane of the time-of-flight camera.

8. The method according to any one of claims **1** to **7**, wherein the raw images are derived from the range imaging sensor (Sri) being placed in front of the torso of the subject.

9. A program comprising instructions which, when the program is executed by a computer, cause the computer to carry out the steps of the method according to any one of claims **1** to **8**.

10. A non-transitory computer readable medium comprising instructions which, when the program is executed by a computer, cause the computer to carry out the steps of the method according to any one of claims **1** to **8**.

11. A system (S) for estimating respiratory parameters of a subject comprising:

- an input module (aM) configured to receive a set of acquisitions derived from a range imaging sensor (Sri), said set of acquisitions comprising at least two raw images comprising at least one portion of a torso of the subject, wherein each point of the raw image represents the distance between the range imaging sensor (Sri) and the subject;
- a surface generation module (sgM) configured to generate a surface image of at least one portion of a surface of the torso of the subject by surface interpolation of the raw image;
- a calculation module (cM) configured to estimate a respiratory signal as a function of time by calculating for each surface image the spatial average,

in a given region of interest defined on the torso of the subject, of the differences between the depth values of the surface image at a given time and the depth values of a reference surface image, obtained from the set of acquisitions, and to calculate respiratory parameters including at least a lung volume as a function of time by multiplying the respiratory signal by the surface of the region of interest;

- an output module configured to output said respiratory parameters.

12. The system according to claim **11**, wherein the calculation module is configured to further calculate a respiratory rate calculated from the detection of inhalation peaks in the respiratory signal.

13. The system according to either one of claim **11** or **12**, wherein the system further comprises a range imaging sensor (Sri).

14. The system according to any one of claims **11** to **13**, wherein the range imaging sensor (Sri) is a time-of-flight camera and the system further comprises a calibration module configured to apply a rotation matrix to the raw images so as to align the subject torso in the raw images with the *xy* plane of the range imaging sensor (Sri).

15. The system according to any one of claims **11** to **14**, wherein the calculation module (cM) is further configured to calculate a tidal volume as the difference between the maximum value and the minimum value in one respiratory cycle of the respiratory signal multiplied by the surface of the region of interest.