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), said set of acquisitions comprising at least one raw image and a reference surface image 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 and wherein the reference surface image comprises depth values;
- generating a surface image of at least one portion of a surface of the torso of the subject by surface interpolation of the at least one raw image (120);
- estimating a respiratory signal as a function of time by:
  - calculating for each generated surface image, differences between depth values in a given region of interest (ROI) defined on the torso of the subject, at a given time, and depth values of the reference surface image; and
  - calculating a spatial average of the obtained differences;
- 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 generated 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 at least one raw image is 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 at least one raw image is 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 one raw image and a reference surface image 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 and wherein the reference surface image comprises depth values;

- 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 at least one raw image;
- a calculation module (cM) configured to:
    - estimate a respiratory signal as a function of time by:
        - calculating, for each generated surface image, differences between depth values in a given region of interest (ROI) defined on the torso of the subject, at a given time, and the depth values of said reference surface image; and
        - calculating a spatial average of the obtained differences;
    - 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 at least one raw image so as to align the subject torso in the at least one raw image 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.