CLAIMS

1. A gateway device operable in a system for monitoring a plurality of bio-signals, the gateway device comprises:

a receiver unit configured to receive data and reconstruct the received data to obtain a digital sound signal representative of the plurality of bio-signals;

a processing unit configured to determine at least one biometric from the digital sound signal and form a digital signal representative of the plurality of bio-signals and the determined at least one biometric, wherein the processing unit is further configured to reconstruct the digital signal into two or more data segments, and wherein each of the two or more data segments comprises a portion of the digital signal, the portion being representative of at least one of:

at least one of the plurality of bio-signals, or

the determined at least one biometric; and

a transmitter unit configured to transmit information including the two or more data segments to an external processing module for further processing.

2. The gateway device as claimed in claim 1, wherein each of the two or more data segments comprises at least three seconds of data.

~~3. The gateway device as claimed in claim 1 or 2, wherein the two or more data segments have different data lengths.~~

~~4~~3. The gateway device as claimed in ~~any one of~~ claim~~s~~ 1 ~~to 3~~or 2, wherein the two or more data segments comprise a first segment and a second segment, wherein the first segment has a data length longer than the second segment.

~~5~~4. The gateway device as claimed in claim ~~4~~3, wherein the first segment is representative of at least one of:

the at least one of the plurality of bio-signals having an occurrence period between about 3 seconds to about 15 seconds, or

the determined at least one biometric having an occurrence period between about 3 seconds to about 15 seconds; and

the second segment is representative of at least one of:

the at least one of the plurality of bio-signals having an occurrence period between about 3 seconds to about 5 seconds, or

the determined at least one biometric having an occurrence period between about 3 seconds to about 5 seconds.

~~6. The gateway device as claimed in claim 4, wherein the second segment is representative of at least one of:~~

~~the at least one of the plurality of bio-signals having an occurrence period between about 3 seconds to about 5 seconds, or~~

~~the determined at least one biometric having an occurrence period between about 3 seconds to about 5 seconds.~~

~~7. The gateway device as claimed in any one of claims 1 to 6, wherein the plurality of bio-signals comprises signals derived from bodily sounds.~~

~~8. The gateway device as claimed in any one of claims 1 to 7, wherein the determined at least one biometric is selected from the group consisting of a heart rate, a heart rate variability, a respiratory rate, a respiratory rate variability and any combination thereof.~~

~~9~~5. The gateway device as claimed in any one of claims 1 to ~~8~~4, wherein the receiver unit is configured to receive the data via a wireless communication protocol for an optimal communication distance ranging up to about 10 m.

~~10~~6. The gateway device as claimed in any one of claims 1 to ~~8~~4, wherein the receiver unit is configured to receive the data via a wireless low-energy communication protocol utilizing Low Complexity Communications Codec.

~~11~~7. The gateway device as claimed in any one of claims 1 to ~~10~~6, wherein the transmitter unit is configured to transmit the information to the external processing module in an external server or a cloud-based platform.

~~12~~8. The gateway device as claimed in any one of claims 1 to ~~11~~7, further comprising a microphone configured to detect ambient sound surrounding the gateway device, and an analogue-to-digital converter configured to convert the ambient sound to a digital equivalent, wherein the processing unit is further configured to remove noise from the digital sound signal based on the digital equivalent of the ambient sound.

~~13~~9. A system for monitoring a plurality of bio-signals, the system comprising:

a wearable acoustic device configured to detect analogue sound signals representative of the plurality of bio-signals, and convert the detected analogue sound signals into data representative of the plurality of bio-signals;

a gateway device configured to receive the data from the wearable acoustic device, reconstruct the received data to obtain a digital sound signal, determine at least one biometric from the digital sound signal and form a digital signal representative of the plurality of bio-signals and the determined at least one biometric, reconstruct the digital signal into two or more data segments, and transmit information including the two or more data segments, wherein each of the two or more data segments comprises a portion of the digital signal, the portion being representative of at least one of:

at least one of the plurality of bio-signals, or

the determined at least one biometric; and

a processing module configured to receive the information, and process the received information for visual display and/or audio display to monitor the plurality of bio-signals and/or the determined at least one biometric.

~~14~~10. The system as claimed in claim ~~13~~9, further comprising at least one user interfacing device configured to display the processed information.

~~15~~11. The system as claimed in claim ~~13~~ 9 or ~~14~~10, wherein the wearable acoustic device comprises at least one sensing unit configured to detect the analogue sound signals; a converter configured to convert the detected analogue sound signals into the data; ~~and~~ a transmitter configured to transmit the data to the gateway device; and optionally at least one of a conditioning and filtering analogue circuit for removing noise in the analogue sound signals or an amplifier configured to amplify the analogue sound signals prior to conversion into the data, the wearable acoustic device being adapted to reconstruct the data into a form of a plurality of data trenches prior to transmission to the gateway device.

~~16. The system as claimed in claim 15, wherein the wearable acoustic device further comprises a conditioning and filtering analogue circuit for removing noise in the analogue sound signals.~~

~~17. The system as claimed in claim 15 or 16, wherein the wearable acoustic device further comprises an amplifier configured to amplify the analogue sound signals prior to conversion into the data.~~

~~18. The system as claimed in any one of claims 15 to 17, wherein the wearable acoustic device is adapted to reconstruct the data into a form of a plurality of data trenches prior to transmission to the gateway device.~~

~~19~~12. The system as claimed in claim ~~18~~11, wherein each of the plurality of data trenches is a 0.5-second trench.

~~20~~13. The system as claimed in any one of claims ~~13~~ 9 to ~~19~~12, wherein the processing module is provided in an external server or a cloud-based platform.

~~21~~14. A method for monitoring a plurality of bio-signals, the method comprising:

detecting analogue sound signals representative of the plurality of bio-signals;

converting the detected analogue sound signals to data representative of the plurality of bio-signals;

reconstructing the data to obtain a digital sound signal,

determining at least one biometric from the digital sound signal and forming a digital signal representative of the plurality of bio-signals and the determined at least one biometric;

reconstructing the digital signal into two or more data segments, wherein each of the two or more data segments comprises a portion of the digital signal, the portion being representative of at least one of:

at least one of the plurality of bio-signals, or

the determined at least one biometric;

processing information including the two or more data segments for visual display and/or audio display <u>via at least one user interface</u> to monitor the plurality of bio-signals and/or the determined at least one biometric.

~~22~~15. The method as claimed in claim ~~21~~14, wherein each of the two or more data segments comprises at least three seconds of data.

~~23. The method as claimed in claim 21 or 22, wherein the two or more data segments have different data lengths.~~

~~24~~16. The method as claimed in ~~any one of~~ claim~~s 21 to 23~~14 or 15, wherein the two or more data segments comprise a first segment and a second segment, wherein the first segment has a data length longer than the second segment.

~~25~~17. The method as claimed in claim ~~24~~16, wherein the first segment is representative of at least one of:

the at least one of the plurality of bio-signals having an occurrence period between about 3 seconds to about 15 seconds, or

the determined at least one biometric having an occurrence period between about 3 seconds to about 15 seconds<u>; and</u>

the second segment is representative of at least one of:

the at least one of the plurality of bio-signals having an occurrence period between about 3 seconds to about 5 seconds, or

the determined at least one biometric having an occurrence period between about 3 seconds to about 5 seconds.

~~26. The method as claimed in claim 24, wherein the second segment is representative of at least one of:~~

~~the at least one of the plurality of bio-signals having an occurrence period between about 3 seconds to about 5 seconds, or~~

~~the determined at least one biometric having an occurrence period between about 3 seconds to about 5 seconds.~~

~~27~~18. The method as claimed in any one of claims ~~21~~ 14 to ~~26~~17, wherein the plurality of bio-signals comprises signals derived from bodily sounds, and the determined at least one biometric is selected from the group consisting of a heart rate, a heart rate variability, a respiratory rate, a respiratory rate variability and any combination thereof.

~~28. The method as claimed in any one of claims 21 to 27, wherein the determined at least one biometric is selected from the group consisting of a heart rate, a heart rate variability, a respiratory rate, a respiratory rate variability and any combination thereof.~~

~~29~~19. The method as claimed in any one of claims ~~21~~ 14 to ~~28~~18, wherein the steps of reconstructing the data to obtain the digital sound signal, and reconstructing the digital signal into the two or more data segments are to be carried out by a gateway device, the gateway device configured to receive the data via a wireless communication protocol for an optimal communication distance ranging up to about 10 m; and

wherein the steps of determining the at least one biometric from the digital sound signal and forming the digital signal representative of the plurality of bio-signals and the determined at least one biometric are carried out by the gateway device.

~~30~~20. The method as claimed in any one of claims ~~21~~ 14 to ~~28~~18, wherein the steps of reconstructing the data to obtain the digital sound signal, and reconstructing the digital signal into the two or more data segments are to be carried out by a gateway device, the gateway device configured to receive the data via a wireless low-energy communication protocol utilizing Low Complexity Communications Codec; and
wherein the steps of determining the at least one biometric from the digital sound signal and forming the digital signal representative of the plurality of bio-signals and the determined at least one biometric are carried out by the gateway device.

~~31. The method as claimed in claim 29 or 30, wherein the steps of determining the at least one biometric from the digital sound signal and forming the digital signal representative of the plurality of bio-signals and the determined at least one biometric are carried out by the gateway device.~~

~~32~~21. The method as claimed in ~~any one of~~ claim~~s 29 to 31~~19 or 20, further comprising reconstructing the data into a form of a plurality of data trenches for transmission to the gateway device.

~~33~~22. The method as claimed in claim ~~32~~21, wherein each of the plurality of data trenches is a 0.5-second trench.

~~34~~23. The method as claimed in any one of claims ~~21~~ 14 to ~~33~~22, wherein the step of processing information including the two or more data segments is to be carried out by a processing module in an external server or a cloud-based platform.

~~35~~24. The method as claimed in any one of claims ~~21~~ 14 to ~~34~~23, further comprising detecting ambient sound; converting the ambient sound to a digital equivalent; and removing noise from the digital sound signal based on the digital equivalent of the ambient sound, prior to the step of reconstructing the digital signal to obtain the two or more data segments.

~~36~~25. The method as claimed in any one of claims ~~21~~ 14 to ~~35~~24, wherein the step of converting the detected analogue sound signals into the data is based on a sampling rate of at least 1 KHz to obtain the data with resolution of at least 16-bits and above.

~~37. The method as claimed in claim 36, wherein the sampling rate is more than 2 KHz.~~

~~38. The method as claimed in any one of claims 21 to 37, further comprising amplifying the analogue sound signal prior to converting the detected analogue sound signal to the data.~~