CLAIMS:

1. A device for imaging a body, the device comprising:

a controller;

storage storing electronic program instructions for controlling the controller;

a display for displaying a user interface; and

an input means;

wherein the controller is operable, under control of the electronic program instructions, to:

provide a visual and audio aid(s) to guide a user to capture image(s) via the input means;

receive input via the input means, the input comprising captured image(s) providing a first representation of the body;

inspect the input comprising captured image(s) and accepting or rejecting captured image(s) according to prescribed criteria;

process the input and/or the inspected input of captured image(s);

generate a second representation of the body on the basis of processing of the input and/or the inspected input; and

display the generated representation via the display.

2. A device according to claim 1, wherein the captured image(s) comprises one or more of: an image; images from different views; image features and data that are visible or can be extracted~~;~~; depth data; keypoints; distinctive facial features; general body features; spatiotemporal features.

3. A device according to claim 1 or 2, wherein the input means comprises one or more sensors, and wherein the one or more sensors are part of a set of sensors, the set of sensors comprising one or more of: a motion sensor; and infra-red sensor; a depth sensor; a three dimensional imaging sensor; an inertial sensor; a Micro-Electromechanical (MEMS) sensor; and imaging means; an acceleration sensor; an orientation sensor; a direction sensor; a position sensor.

4. A device according to claim 3, wherein the captured image(s) comprises one or more visual representations of the body, wherein the one or more sensors comprises an imaging means operable to capture the one or more visual representations of the body, and wherein the one or more sensors comprises an orientation sensor operable to provide orientation data for use during capture of the one or more visual representations of the body to facilitate alignment thereof to a plane for increased accuracy.

5. A device according to claim 4, wherein the one or more visual representations of the body include at least one photograph of a front view of the body and at least one photograph of a side view of the body.

6. A device according to claim 5, wherein the photographs comprise at least one of: standard two dimensional (2D) binary, gray or color images; depth images with or without colors and/or textures; a complete three dimensional (3D) point cloud or a number of incomplete point clouds of the body with or without colors and/or texture; and/or a three dimensional (3D) mesh of the body with or without colors and/or texture.

7. A device according to any one of the preceding claims, wherein providing the visual and/or audio aid(s) comprises instructing the user via audible sounds/words/speech to align parts of the body in accordance with an alignment process, wherein the electronic program instructions are operable to control the alignment process by errors calculated between characteristics including shape, pose, and spatiotemporal features.

8. A device according to any one of claims 4 to 7, wherein the controller is further operable, under control of the electronic program instructions, to:

segment at least one foreground comprising the body of one or more visual representations of the body of the captured image(s);

convert the one or more segmented foregrounds of the one or more visual representation(s) of the captured image(s) into respective silhouettes;

use the one or more segmented foregrounds and their respective silhouettes to construct a hull of the shape of the body, and/or extract features, and/or extract measurements of key points; and

use one or more of the hull, and/or features, and/or key point measurements,~~,~~ to modify, rig, and morph a 3D model of a body (an average body model) to create a modified subject-specific 3D model being the representation.

9. A device according to claim 8, wherein in the case of depth images, point clouds and meshes, any with or without colours and/or textures, the controller is operable, under control of the electronic program instructions, to reconstruct a three dimensional subject-specific shape of the body.

10. A device according to any one of the preceding claims, wherein the controller is further operable, under control of the electronic program instructions, to:

process the captured~~a~~ image(s) by segmenting the captured image(s) to obtain a plurality of silhouettes which represent projected shadows of a substantially true three dimensional scan of the body; and

generate the representation of the body on the basis of the silhouettes and thousands of known human shapes learned offline using intelligent machine learning techniques.

11. A device according to any one of the preceding claims, wherein the controller is further operable, under control of the electronic program instructions, to:

calculate on the basis of user height information submitted, image size (image height and width in pixels), image features and/or key-points, and using a blob analysis of binary images, projection theories and camera models, the following:

initial estimates of intrinsic and extrinsic parameters of the capturing camera which includes camera position and orientation in each image, defined as pose P; and

initial estimates of joint kinematics of a skeletal model representing a skeleton of the body, defined as JK, including 3D position and 3D orientation of each joint of the skeletal model.

12. A device according to any one of the preceding claims, wherein the controller is further operable, under control of the electronic program instructions, to:

predict on the basis of the user height and weight information submitted, or the user height information only, an initial on-average avatar, defined as Av, which varies with the user's entered height, weight or other body measurements if known; and,

rig the on-average avatar Av to a reference skeleton of size N-joints with known skeletal model JK in a reference pose, and a bone weight/height matrix defined as W.

13. A device according to claim 12, wherein the matrix W is calculated offline just once during a learning process of the prediction process, then saved together with the reference skeletal model JK to be used for prediction or generation of other avatars, the purpose of W being to constrain, control and model the relationship between joints, bones and the actual 3D avatar surface represented by its vertices V, edges E and faces F.

14. A device according to claim 13, wherein the process of predicting the initial on-average avatar Av follows a multivariate-based machine learning approach.

15. A device according to any one of claims 1 to 9, wherein the input comprises a classification of the body, and the controller is further operable, under control of the electronic program instructions, to:

on the basis of the classification of the body, obtain data corresponding to the body classification;

process the captured image(s) by comparing the captured image(s) and the obtained data; and

generate the representation of the body on the basis of the comparison.

16. A device according to claim 15, wherein the obtained data comprises at least one of: a template; an earlier representation of the body; and an integration of, or of data of or associated with, one or more earlier representations of the body, and/or other bodies.

17. A device according to claim 1, wherein the body is a body of a user, and the captured image(s) comprises one or more visual representations of the body, and further wherein the controller is operable, under control of the electronic program instructions, to:

enable the user to align the body in the captured image(s) with a generated user-specific skeleton, at least in part by (i) displaying the user specific skeleton along with one or more real time captured images of the body and (ii) instructing the user to move in such a manner that the displayed body is aligned to the displayed user-specific skeleton;

process the captured image(s), when the displayed body has been aligned with the displayed user-specific skeleton, by segmenting the one or more visual representations of the body of the captured image(s) to obtain a plurality of silhouettes which correspond to projected shadows of a substantially true three dimensional scan of the body; and

generate the representation of the body on the basis of the plurality of silhouettes.

18. A device according to any one of the preceding claims, wherein the body is at least one of: a human body, or one or more parts thereof; a living thing, or one or more parts thereof; a non-living thing, or one or more parts thereof.

19. A method for imaging a body, the method comprising:

storing electronic program instructions for controlling a controller; and

controlling the controller via the electronic program instructions, to:

provide a visual and audio aid(s) to guide a user to capture image(s) via an input means;

receive an input via the input means, the input comprising captured image(s) providing a first representation of the body;

inspect the input comprising captured image(s) and accepting or rejecting captured image(s) according to prescribed criteria;

process the input and/or the inspected input of captured image(s);

generate a second representation of the body on the basis of processing of the input and/or the inspected input; and

display the generated second representation via a display.

20. A method according to claim 19, wherein the captured image(s) comprises one or more of: an image; images from different views; image features and data that are visible or can be extracted; depth data; key-points; distinctive facial features; general body features; spatiotemporal features.

21. A method according to claim 19 or 20, wherein providing the visual and audio aid(s) comprises instructing the user via audible sounds/words/speech to align parts of the body in accordance with an alignment process, wherein the electronic program instructions are operable to control the alignment process by errors calculated between characteristics including shape, pose, and spatiotemporal features.

22. A method according to any one of claims 19 to 21, further comprising controlling the controller via the electronic program instructions, to:

segment at least one foreground comprising the body of one or more visual representations of the body of the captured image(s);

convert the one or more segmented foregrounds of the one or more visual representations of the captured image(s) into respective silhouettes;

use the one or more segmented foregrounds and their respective silhouettes to construct a hull of a shape of the body, and/or extract features, and/or extract measurements of key points; and

use one or more of the hull, and/or features, and/or key point measurements,~~,~~ to modify, rig, and morph a 3D model of a body (an average body model) to create a modified subject-specific 3D model image being the representation.

23. A method according to claim 22, wherein in the case of depth images, point clouds and meshes, any with or without colours and/or textures, the controller is controlled via the electronic program instructions, to reconstruct a three dimensional subject-specific shape of the body.

24. A method according to any one of claims 19 to 23, further comprising controlling the controller via the electronic program instructions to:

process the captured image(s) by segmenting the captured image(s) to obtain a plurality of silhouettes which represent projected shadows of a substantially true three dimensional scan of the body; and

generate the representation of the body on the basis of the silhouettes and thousands of known human shapes learned offline using intelligent machine learning techniques.

25. A method according to any one of claims 19 to 24, further comprising controlling the controller via the electronic program instructions to:

calculate on the basis of user height information submitted, image size (image height and width in pixels), image features and/or key-points, and using blob analysis of binary images, projection theories and camera models, the following:

initial estimates of intrinsic and extrinsic parameters of the capturing camera which includes camera position and orientation in each image, defined as pose P; and,

initial estimates of joint kinematics of a skeletal model representing a skeleton of the body, defined as JK, including 3D position and 3D orientation of each joint of the skeletal model.

26. A method according to any one of claims 19 to 25, further comprising controlling the controller via the electronic program instructions, to:

predict on the basis of the user height and weight information submitted, or the user height information only, an initial on-average avatar, defined as Av, which varies with the user's entered height, weight or other body measurements if known; and,

rig the on-average avatar Av to a reference skeleton of size N-joints with known skeletal model JK in a reference pose, and a bone weight/height matrix defined as W.

27. A method according to claim 26, wherein the matrix W is calculated offline just once during a learning process of the prediction process, then saved together with the reference skeletal model JK to be used for prediction or generation of other avatars, the purpose of W being to constrain, control and model the relationship between joints, bones and the actual 3D avatar surface represented by its vertices V, edges E and faces F.

28. A method according to claim 27, wherein the process of predicting the initial on-average avatar Av follows a multivariate-based machine learning approach.

29. A method according to any one of claims 19 to 21, wherein the input comprises a classification of the body, further comprising controlling the controller via the electronic program instructions, to:

on the basis of the classification of the body, obtain data corresponding to the body classification;

process the captured image(s) by comparing the captured image(s) and the obtained data; and

generate the representation of the body on the basis of the comparison.

30. A method according to claim 29, wherein the obtained data comprises at least one of: a template; an earlier representation of the body; and an integration of, or of data of or associated with, one or more earlier representations of the body, and/or other bodies.

31. A method according to any one of claims 19 to 21, wherein the body is a body of a user, and the captured image(s) comprises one or more visual representations of the body, further comprising controlling the controller via the electronic program instructions, to:

enable the user to align the body in the captured image(s) with a generated user-specific skeleton, at least in part by (i) displaying the user specific skeleton along with one or more real time captured images of the body and (ii) instructing the user to move in such a manner that the displayed body is aligned to the displayed user-specific skeleton;

process the captured image(s), when the displayed body has been aligned with the displayed user-specific skeleton, by segmenting the one or more visual representations of the body of the captured image(s) to obtain a plurality of silhouettes which correspond to projected shadows of a substantially true three dimensional scan of the body; and

generate the representation of the body on the basis of the plurality of silhouettes.

32. A method according to any one of claims 19 to 31, wherein the body is at least one of: a human body, or one or more parts thereof; a living thing, or one or more parts thereof; a non-living thing, or one or more parts thereof.

33. A computer-readable storage medium on which is stored instructions that, when executed by a computing means, causes the computing means to perform the method in accordance with any one of claims 19 to 32.

34. A computing means programmed to carry out the method in accordance with any one of claims 19 to 32.

35. A data signal including at least one instruction being capable of being received and interpreted by a computing system, wherein the instruction implements the method in accordance with any one of claims 19 to 32.

36. A system for imaging a body comprising a device according to any one of claims 1 to 18.

37. A device according to any one of claims 1 to 18 to generate and display one or more representations of a body via the display to provide motivation for achieving an objective.

38. A device according to claim 37, wherein the body is a human body, wherein the one or more representations comprise a~~n anthropometrically accurate~~ subject-specific image of the human body to promote and assist in the achievement of a personal fitness goal through monitoring of the human body.

39. A device according to any one of claims 1 to 18, wherein the input comprises a classification of the body.

40. A method according to any one of claims 19 to 32, wherein the input comprises a classification of the body.