What is claimed is:

CLAIMS

1. A computer-implemented multi-joint tracking method performed by one or more processors, the method comprising:

assigning at least a first location of at least one embedded device, the at least one embedded device comprising at least one sensor and being associated with at least one joint capable of movement, the first location being captured by the at least one sensor;

assigning at least a second location of the at least one embedded device, the second location being captured by observation of the at least one embedded device by at least one external sensor, wherein the at least one external sensor tracks motion of the at least one joint with respect to an external reference, wherein the at least one external sensor is a Red Green Blue – Depth (RGB-D) sensor;

establishing a pose correspondence between the at least first location and the at least second location using a model of the at least one joint to extract relative information between the at least one embedded device at the at least first location and the at least one embedded device at the at least second location;

calibrating the at least one sensor of the at least one embedded device by tracking a change in a pose captured by the at least one external sensor and a change in the pose, captured by the at least one sensor of the at least one embedded device as the at least one joint moves in order to obtain at least one calibrated sensor of the at least one embedded device;

determining that each of the at least one calibrated sensor is not observed by the at least one external sensor;

inferring a relative position of the at least one calibrated sensor and the at least one joint, in real-time, using the model of the at least one joint based on the determination that each of the at least one calibrated sensor is not observed by the at least one external sensor, thereby tracking overall position and motion of the at least one joint;

performing at least one of:

one or more actions on an external object based on inference of the relative position of the at least one calibrated sensor and the at least one joint, as the at

least one joint moves; and

providing feedback to a user at least in part based on inference of the relative position of the at least one calibrated sensor and the at least one joint as the at least one joint moves by activating an actuator of the at least one embedded device.

2. The method as recited in claim 1, further comprising the steps of:

capturing a plurality of first locations reported by the at least one sensor during movement of the at least one joint;

capturing a plurality of second locations reported by the at least one external sensor during movement of the at least one joint;

determining a plurality of joint poses from the plurality of first locations, the plurality of second locations and the model; and

calculating metrics using the plurality of joint poses.

3. The method as recited in claim 2, further comprising the step of storing tracked data at least comprising, the plurality of first locations, the plurality of second locations, the plurality of joint poses, and the metrics.

4. The method as recited in claim 1, further comprising the step of generating a display at least in part based on the feedback.

5. The method as recited in claim 1, in which the at least one joint is associated with a user.

6. The method as recited in claim 1, in which the at least one joint is associated with a spine.

7. A non-transitory computer-readable storage medium with an executable program stored therein, wherein the program instructs one or more processors to perform a multi-joint tracking method, the method comprising:

steps for assigning a first location of an embedded device captured by a sensor of the embedded device, the embedded device being associated with at least one joint;

steps for assigning a second location of the embedded device captured by

observation by an external sensor, wherein the external sensor tracks motion of the at least one joint with respect to an external reference, wherein the external sensor is a Red Green Blue – Depth (RGB-D) sensor;

steps for establishing a pose correspondence between the first location and the second location to extract relative information between the embedded device at the first location and the embedded device at the second location;

steps for calibrating the sensor of the embedded device by tracking a change in a pose captured by the external sensor and a change in the pose captured by the sensor of the embedded device as the at least one joint moves in order to obtain a calibrated sensor of the embedded device;

steps for determining that the calibrated sensor is not observed by the external sensor;

steps for inferring a relative position of the calibrated sensor and the at least one joint, in real-time, using the model of the at least one joint based on the determination that the calibrated sensor is not observed by the external sensor, thereby tracking overall position and motion of the at least one joint;

steps for performing at least one of:

one or more actions on an external object based on inference of the relative position of the calibrated sensor and the at least one joint, as the at least one joint moves; and

providing feedback to a user at least in part based on inference of the relative position of the calibrated sensor and the at least one joint as the at least one joint moves by activating an actuator of the embedded device.

8. The method as recited in claim 7, further comprising:

steps for capturing a plurality of first locations during movement of the joint;

steps for capturing a plurality of second locations during movement of the joint;

steps for determining a plurality of joint poses; and

steps for calculating metrics.

9. The method as recited in claim 8, further comprising steps for storing tracked data.

10. The method as recited in claim 7, further comprising steps for generating a display based on the feedback.

11. A non-transitory computer-readable storage medium with an executable program stored thereon, wherein the program instructs one or more processors to perform the following steps:

assigning at least a first location of at least one embedded device, the at least one embedded device comprising at least one sensor and being associated with at least one joint capable of movement, the at least first location being captured by the at least one sensor;

assigning at least a second location of the at least one embedded device, the at least second location being captured by observation of the at least one embedded device by at least one external sensor, wherein the at least one external sensor tracks motion of the at least one joint with respect to an external reference, wherein the at least one external sensor is a Red Green Blue – Depth (RGB-D) sensor;

establishing a pose correspondence between the at least first location and the at least second location using a model of the at least one joint to extract relative information between the at least one embedded device at the at least first location and the at least one embedded device at the at least second location;

calibrating the at least one sensor of the at least one embedded device by tracking a change in a pose captured by the at least one external sensor and a change in the pose captured by the at least one sensor of the at least one embedded device as the at least one joint moves in order to obtain at least one calibrated sensor of the at least one embedded device;

determining that each of the at least one calibrated sensor is not observed by the at least one external sensor;

inferring a relative position of the at least one calibrated sensor and the at least one joint, in real-time, using the model of the at least one joint based on the determination that each of the at least one calibrated sensor is not observed by the at least one external sensor, thereby tracking overall position and motion of the at least one joint;

performing at least one of:

one or more actions on an external object based on inference of the

relative position of the at least one calibrated sensor and the at least one joint, as the at least one joint moves; and

providing feedback to a user at least in part based on inference of the relative position of the at least one calibrated sensor and the at least one joint as the at least one joint moves by activating an actuator of the at least one embedded device.

12. The program instructing the one or more processors as recited in claim 11, further comprising the steps of:

capturing a plurality of first locations reported by the at least one sensor during movement of the at least one joint;

capturing a plurality of second locations reported by the at least one external sensor during movement of the at least one joint;

determining a plurality of joint poses from the plurality of first locations, the plurality of second locations and the model; and

calculating metrics using the plurality of joint poses.

13. The program instructing the one or more processors as recited in claim 12, further comprising the step of storing tracked data at least comprising, the plurality of first locations, the plurality of second locations, the plurality of joint poses, and the metrics.

14. The program instructing the one or more processors as recited in claim 11, further comprising the step of generating a display at least in part based on the feedback.