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U.S. Patent 9,818,285

U.S. Patent 9,818,285 (“*Lightning Fitness Systems*” or the “patent-at-issue”) was filed on March 18, 2014, and claims priority on March 15, 2013. Claim 1 of the patent-at-issue describes a method for receiving sensory feedback while moving. The method includes the use of sensor relays, output devices, movement devices, and computer processors. Initially, the sensor relays detect information related to the user. This information is then transmitted to the computer processors, which analyze it against one or more default or user defined set points. Based on this analysis, a signal may be sent to output devices to provide feedback to the user or decision-maker regarding various control factors measured against the set points or send signals to movement devices to control their operation based on the analysis of the received sensory feedback.

The primary reference, U.S. Patent 9,642,415 (“*New Balance*”), was filed on February 7, 2012, and claims priority on February 7, 2011. The patent discloses systems and methods for monitoring athletic performance. This apparatus in this patent monitors the athletic performance characteristics of a user which consists of a sensing unit that can be attached to the user's shoe. Within this sensing unit, there are several components. Firstly, there's a sensor, including a gyroscopic sensor, which tracks the angular velocity data of the user's foot movements. This data is then processed by the apparatus to determine specific athletic performance characteristics. The processing means compare this processed data to predetermined values associated with different types of foot strikes, like heel strikes, midfoot strikes, or forefoot strikes. Additionally, there's a periodic trigger mechanism that distinguishes between individual strides, allowing the apparatus to identify specific points in the gait cycle before a foot strike event. This trigger is activated during the foot swing portion of each cycle when a preset level of negative angular velocities is reached. Finally, the apparatus includes transmitting means to send a data package representing the performance characteristics to a remote receiver. This data package indicates whether a heel strike, midfoot strike, or forefoot strike has occurred, providing valuable insights into the user's athletic performance.

The secondary reference, JP2012228568 (“*Adidas*”), was published on November 22, 2012. The JP application relates to a sports electronic training system and method of providing training feedback. The method involves providing training feedback to an individual. The movement of the individual's foot during training is monitored using an accelerometer. Then, a performance parameter is calculated based on this monitoring, likely indicating aspects of the individual's performance, such as speed, cadence, or form. The performance parameters are transmitted to a portable electronic processing device for further analysis. Next, these performance parameters are compared to predefined performance goals stored within the device. If the performance parameter deviates from the goal, a self-adapting feedback mechanism is triggered. This feedback is delivered to the individual through a virtual trainer program, likely through visual or auditory cues. The feedback is dynamic and adjusts based on previous responses and their effectiveness.

The secondary reference, U.S. Patent 8,845,494 (“*Whitall*”), was filed on September 29, 2009, and claims priority on October 1, 2008. The patent relates to a step trainer for enhanced performance using rhythmic cues. The method is designed to enhance gait parameters in individuals who require improvement. It involves several steps facilitated by a processor which determines the characteristics of ideal spatial and temporal gait parameters for the individual. The processor calculates a rhythmic audio cue based on desired changes in the individual's gait, in comparison to the ideal and actual gait parameters. This audio cue is tailored to help the individual adjust their gait.

The secondary reference, U.S. Patent 9,226,706 (“*Alert Core*”), was filed on December 18, 2013, and claims priority on December 19, 2012. The patent relates to promoting the usage of core muscles which is aimed at developing procedural memory for core muscle support, focusing on enhancing core muscle activation during specific movements. It involves a wearable device comprising a movement sensor, a contraction sensor, and a signal processor. Initially, the movement sensor detects body movements, while the contraction sensor detects contractions of the core muscles located in the abdominal area. The signal processor then determines if the detected body movement benefits from core muscle contraction and assesses the timing relationship between the movement and core contraction. It further distinguishes between "protected" movements, where core contraction coincides with body movement, and "unprotected" movements, where it does not. Finally, the method includes providing immediate local feedback through an output device, integrated into the wearable device, triggered by core contractions or specific movement detections.

A sample claim chart comparing claim 1 of “*Lightning Fitness Systems*” to “*New Balance*”, “*Adidas*”, “*Whitall*”, and “*Alert Core*” is provided below.

<p style="text-align: center;">US9818285 (“<i>Lightning Fitness Systems</i>”)</p>	<p style="text-align: center;"> A. US9642415 (“<i>New Balance</i>”) B. JP2012228568 (“<i>Adidas</i>”) C. US8845494 (“<i>Whitall</i>”) D. US9226706 (“<i>Alert Core</i>”) </p>
<p>1.pre. A method of receiving sensory feedback while moving involving:</p>	<p>A. US9642415 “The present invention is directed towards novel systems, methods and devices for monitoring one or more athletic performance characteristic of a user and/or providing biofeedback information to the user to assist in training the user to run with better form and, for example, with an improved foot strike.” <i>New Balance</i> at col. 1:52-57</p> <p>“By placing one or more sensors on the body of a runner (e.g., on or in one or more shoe and/or piece of apparel), the systems and methods described herein may be used as a coaching tool to provide substantially instantaneous feedback and coaching during athletic activity, and also store information for evaluation and further processing after the run.” <i>New Balance</i> at col. 4:57-63</p> <p>B. JP2012228568 “In some embodiments, the system includes at least one monitor and a portable electronic processing device that receives data from the at least one monitor and provides feedback to the individual based on the received data.” <i>Adidas</i> at p. 2 of the translation document</p> <p>“In some embodiments, the virtual trainer of the present invention provides feedback to the individual 4400 while the individual 4400 is exercising. This feedback encourages and / or helps to increase and / or maximize the number of health, fitness and / or strength points earned by the individual.” <i>Adidas</i> at p. 63 of the translation document</p> <p>“FIG. 4A is a diagram of an exemplary motion monitor 400 according to an embodiment of the invention. The motion monitor 400 represents one embodiment of the motion monitor described above. As shown in FIG. 4A, the motion monitor 400 includes a processor 402, a memory 404, an acceleration sensor 406, a transceiver 408, and a battery 410.” <i>Adidas</i> at p. 18 of the translation document</p>

<p>(cont.) 1.pre. A method of receiving sensory feedback while moving involving:</p>	<p>C. US8845494 “For example, an embodiment of the present invention relates to a system that links sensors (for step length and step rate) to an audio cue provided to headphones, while providing the appropriate algorithms to accomplish real time adjustments to better help change the person's step length/rate ratio in a desired direction depending on therapeutic or performance goals.” <i>Whitall</i> at col. 2:21-27</p> <p>D. US9226706 “Embodiments disclosed include a system for development of core muscles' support, comprising a means for identifying a user qualifying movement, a means for detecting a core muscle contraction in the identified qualifying movement, a means for discriminating between a core muscle contraction and no core muscle contraction in the identified qualifying movement; and a means to provide feedback to the user.” <i>Alert Core</i> at col. 3:19-25</p> <p>“The wearable device further comprises a means to provide immediate feedback through an external device to improve the user's core muscle usage.” <i>Alert Core</i> at col. 3:42-44</p> <p>“Alternatively, an additional wrist wearable device comprising means to communicate with the single or plurality of sensors and the said single or plurality of signal processors enables monitoring of the core and further monitoring of rotation of the user's hips.” <i>Alert Core</i> at col. 10:30-34</p>
<p>1.a. one or more sensor relays;</p>	<p>A. US9642415 “One embodiment of the invention includes a system 100 for providing biofeedback information to a runner 115 for use in improving running form. The system 100, as shown in FIG. 1, includes one or more sensors 105 attached to (e.g., embedded within, fixedly coupled to, or releasably coupled to) a portion of a shoe 110 of a runner 115 to measure one or more data conditions/performance characteristics during athletic activity (e.g., a run). The system 100 also includes one or more remote receiving systems 120 for receiving data from the sensor(s) 105 and communicating information to the runner based on an analysis of the gathered data. The analysis of the gathered data may be carried out in a processor located in the shoe 110, the remote receiving system 120, and/or a separate analyzing unit (e.g., a personal computer).</p>

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1.a. **one or more sensor relays;**

One or more sensors 105 can be placed in each shoe 110 of the runner 115, or in only a single shoe 110 of the runner 115.” *New Balance* at col. 6:37-53

B. JP2012228568

“FIG. 6 is a diagram of a fourth exemplary winged battery cap for **motion monitoring**, according to an embodiment of the present invention. 1 is a **heart rate monitor with a built-in sensor for determining body fat percentage**, according to an embodiment of the present invention.” *Adidas* at p. 4 of the translation document

“As shown in FIG. 4A, the **motion monitor 400 includes** a processor 402, a memory 404, **an acceleration sensor 406**, a transceiver 408, and a battery 410.” *Adidas* at p. 18 of the translation document

“FIG. 43 is a diagram showing monitoring of a sports player 4302 and a sports ball 4304 using the components of the present invention. A sports player 4302 wears sports clothing in which a multi-sensor monitor 4200 is incorporated. The **monitor 4200 collects information about the athlete 4302 and sends this information to a device** that displays the information on the display 4306.” *Adidas* at p. 61 of the translation document

C. US8845494

“Referring to FIG. 5, a schematic depiction 500 of a gait parameters includes a left foot 510 and right foot 520, each with a **sensor 530**.” *Whitall* at col. 3:22-24

18. The apparatus of claim 9 further comprising **a signal conditioner between the sensor and the processor**. *Whitall* at claim 18

D. US9226706

“Another embodiment includes a device for assisting in the development of a user's core muscles, the device comprising: **a single or plurality of sensors, and a single or plurality of signal processors**. The single or plurality of sensors is further coupled with/to the single or plurality of signal processors.” *Alert Core* at col. 10:3-7

1.b. **any number of output devices;**

A. US9642415

“The remote receiving unit 310 can include elements such as, but not limited to, a transmitting/receiving element 330 for receiving the transmitted data from the sensing unit 305, a remote user feedback element 335 for receiving the data, a storage unit 340 for storing raw and/or analyzed data, a **communication element 345 (e.g., a visual display such as a graphical user interface (GUI), an auditory communication element, and/or a tactile user interface) for communicating biofeedback information determined from the analyzed data to an athlete**, and a power source 350.” *New Balance* at cols. 9:65-10:7

B. JP2012228568

“This feedback may be, for example, **visual feedback displayed on the display 1302 of the portable electronic processing device 1300 and / or audio provided to the user using headphones** connected to the audio jack of the portable electronic processing device 1300. Feedback. Visual feedback can be displayed continuously and updated during training. Auditory feedback is provided, for example, when the user taps portable electronic processing device 1300 twice.” *Adidas* at p. 32 of the translation document

“The **display 308** is used for displaying information to the user. In some embodiments, display 308 is a liquid crystal display.” *Adidas* at p. 14 of the translation document

“FIG. 43 is a diagram showing monitoring of a sports player 4302 and a sports ball 4304 using the components of the present invention. A sports player 4302 wears sports clothing in which a multi-sensor monitor 4200 is incorporated. The monitor 4200 collects information about the athlete 4302 and sends this information to a device that displays the information on the **display 4306**.” *Adidas* at p. 61 of the translation document

C. US8845494

“The **generated rhythmic auditory cues 950 can be given via headphones 970**. The processor 940 may generate individualized rhythmic auditory cues 951, 952 with desired pitch and amplitude for each ear. Alternatively, a **display screen 960 may visually display the gait cues**.” *Whitall* at col. 10:20-25

<p>(cont.) 1.b. any number of output devices;</p>	<p>D. US9226706 “Further, preferably the system includes a means to utilize an exercise application and a means to identify when the core should be contracted in relation to other movement(s) via image on a display, audible instruction, or video.” <i>Alert Core</i> at col. 9:63-66</p> <p>“For example, hand movements may be monitored and scored against movement targets or tracked and displayed on a monitoring device in order to provide immediate feedback in the form of a performance score or visual feedback to evaluate specific movements or movement characteristics.” <i>Alert Core</i> at col. 10:62-67</p>
<p>1.c. any number of movement devices;</p>	<p>A. US9642415 “Alternatively, or in addition, the remote receiver may be a laptop computer, a tablet computer, a desktop personal computer, and/or an athletic training system (e.g., a treadmill).” <i>New Balance</i> at col. 10:46-49</p> <p>“In an alternative embodiment the analyzing and controlling steps may be carried out by a control element embedded within, or attached to, the shoe, without the need for a remote receiver.” <i>New Balance</i> at col. 21:42-46</p> <p>B. JP2012228568 “FIG. 12 is a diagram of an exemplary portable electronic processing device 1200 that interacts with various exercise machines, according to some embodiments of the present invention. As shown in FIG. 12, in one embodiment, such an exercise machine may include an exercise bike 1202, a rowing machine 1204, a steer climber 1206, an elliptical machine 1208, and / or a treadmill 1210.” <i>Adidas</i> at p. 28 of the translation document</p> <p>C. US8845494 “Referring now to FIG. 3, an audio cue gait improvement system 300 for use with a treadmill is described. Similar to the device 200 described above, the system 300 includes a processor and a storage device (neither depicted) for forming audio cuing data. The system 300 may include a user interface that has, for example, a display 301 and an input device 302. A moving belt 310 driven by motor (also not depicted) travels at one or more preset speed(s), causing the user to move at that speed(s).” <i>Whitall</i> at col. 6:54-62</p>

<p>(cont.) 1.c. any number of movement devices;</p>	<p>D. US9226706 “An embodiment includes a wearable device for assisting in the development of core muscle usage used with exercise equipment, comprising a means to translate movements on exercise equipment into identified qualifying movements and a means to communicate with the wearable device monitoring core contractions, and a means to determine if the exercise movement is a protected or unprotected qualifying movement, and a means to provide feedback to the user.” <i>Alert Core</i> at col.4:5-12</p>
<p>1.d. one or more computer processors that:</p> <p>receive a signal from any of the one or more sensor relays, detecting the information related to the user;</p> <p>analyze the detected information against one or more default or user defined set points;</p>	<p>A. US9642415 “The means for determining a performance characteristic of the user may include a microprocessor.” <i>New Balance</i> at col. 2:3-5</p> <p>“The system 100, as shown in FIG. 1, includes one or more sensors 105 attached to (e.g., embedded within, fixedly coupled to, or releasably coupled to) a portion of a shoe 110 of a runner 115 to measure one or more data conditions/performance characteristics during athletic activity (e.g., a run). The system 100 also includes one or more remote receiving systems 120 for receiving data from the sensor(s) 105 and communicating information to the runner based on an analysis of the gathered data. The analysis of the gathered data may be carried out in a processor located in the shoe 110, the remote receiving system 120, and/or a separate analyzing unit (e.g., a personal computer). One or more sensors 105 can be placed in each shoe 110 of the runner 115, or in only a single shoe 110 of the runner 115.” <i>New Balance</i> at col. 6:39-53</p> <p>1. An apparatus for monitoring one or more athletic performance characteristics of a user, the apparatus comprising: a sensing unit adapted to be attachable to a shoe of a user, the sensing unit comprising: (i) a first sensor adapted to monitor a movement of a foot of the user while the user is in motion, the first sensor comprising a gyroscopic sensor for measuring angular velocity data for the foot of the user; (ii) processing means for (a) processing the angular velocity data from the first sensor to determine a processed value indicative of a first athletic performance characteristic comprising a foot strike location of a foot of the user upon striking a ground surface, and (b) comparing the processed</p>

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1.d. **one or more computer processors** that:

receive a signal from any of the one or more sensor relays, detecting the information related to the user;

analyze the detected information against one or more default or user defined set points;

value to a range of predetermined comparison values to determine the athletic performance characteristic relating to the processed value, the range of comparison values comprising a first range of values indicative of a heel strike, a second range of values indicative of a midfoot strike, and a third range of values indicative of a forefoot strike; *New Balance* at claim 1

B. JP2012228568

“This information is wirelessly transmitted to the **portable electronic processing device** 4101 and displayed on the display. In embodiments, other small sensors, such as pressure sensors, altimeters, magnetic field sensors, etc. are included in the sports ball to **collect further information that is transmitted to the portable electronic processing device** 4101. Is displayed.” *Adidas* at p. 56 of the translation document

“As shown in FIG. 2A, the sports shirt 203 has an integral or removable heart rate monitor 106a. The heart rate monitor 106 a determines the **heart rate of the wearer** of the sports shirt 203 and **sends this information** to, for example, the mobile phone 202. In some embodiments, heart rate monitor 106 a communicates with mobile phone 202 in a manner similar to that described with respect to exercise monitor 104.” *Adidas* at p. 12 of the translation document

“The information collected by the **sensor / motion monitor is analyzed by the virtual trainer** of the present invention and used to provide the runner with feedback on how his running form and / or gait cycle can be improved.” *Adidas* at p. 60 of the translation document

“FIG. 13 is a diagram of an exemplary **portable electronic processing device** 1300 **that includes a sports mode of operation with virtual trainer functionality**, according to some embodiments of the present invention.” *Adidas* at p. 29 of the translation document

C. US8845494

9. An apparatus for the improvement of a gait parameter in a subject in need thereof, the apparatus comprising: a **processor configured to determine attributes of ideal spatial and temporal gait parameters of the subject; receive data from a sensor, wherein the sensor is configured to measure attributes of actual spatial and temporal gait parameters of**

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1.d. **one or more computer processors** that:

receive a signal from any of the one or more sensor relays, detecting the information related to the user;

analyze the detected information against one or more default or user defined set points;

the subject comprising step length and step rate of the subject; determine a rhythmic audio cue based on desired gait changes in the subject considering attributes of ideal spatial and temporal gait parameters of the subject and the received sensor data of attributes of actual spatial and temporal gait parameters; and forward data configured to produce the rhythmic audio cue based on a desired gait change for the subject. *Whitall* at claim 9

“The rate of the audio signal determined in step 130 may be provided to the user in step 140. For example, the **audio signal may be provided to a speaker or headphone** to reproduce and present the audio cue to the user.” *Whitall* at col. 5:22-25

“The **acquired gait data is analyzed** in step 740 **in comparison to an ideal gait.**” *Whitall* at col. 9:42-43

D. US9226706

“Another embodiment includes a device for assisting in the development of a user's core muscles, the device comprising: **a single or plurality of sensors, and a single or plurality of signal processors.** The single or plurality of sensors is further coupled with/to the single or plurality of signal processors.” *Alert Core* at col. 10:3-7

“Alternatively, an additional wrist wearable device comprising means to communicate with the single or plurality of sensors and the said single or plurality of **signal processors enables monitoring of the core and further monitoring of rotation of the user's hips.**” *Alert Core* at col. 10:30-34

1. A method for development of procedural memory for core muscles based support, comprising: providing a **movement sensor and a contraction sensor that are in communication with a signal processor**, wherein the movement sensor, the contraction sensor and the signal processor are components of a wearable device...” *Alert Core* at claim 1

“FIG. 8 illustrates a high level view of the signal processing blocks of an embodiment of a system for teaching and developing core usage and Support with a video or app wherein the **core activity is compared with a target core activity including elements such as contraction intensity, timing, and movement of the monitored core region inwards or outwards, or a core contraction without**

<p>(cont.) 1.d. one or more computer processors that:</p> <p>receive a signal from any of the one or more sensor relays, detecting the information related to the user;</p> <p>analyze the detected information against one or more default or user defined set points;</p>	<p>movement. FIG. 9 illustrates the high level block diagram of FIG.8 wherein the comparison between the user's core activity and the target core activity as well as feedback is performed on the external device.” <i>Alert Core</i> at cols. 14:62-15:5</p>
<p>1.e. and either:</p> <p>send a signal to any of the output devices, instructing the decision maker with feedback related to one or more control factors measured against one or more set points;</p> <p>or</p> <p>send a signal to any of the movement devices, controlling said movement devices based on said analysis.</p>	<p>A. US9642415 “This may be beneficial in providing context for each foot strike to ensure that accurate data and instructions are communicated to the runner, as even runners with good running for will tend to heel strike when running down a substantial incline and forefoot strike when running up a substantial incline.” <i>New Balance</i> at col. 21:24-29</p> <p>“Alternatively, or in addition, the auditory signal may include a click, beep, or other simple signal that can provide a runner with a warning if their running form does not meet a certain requirement and/or provide a positive signal if their running form does meet the required parameters. Such simple auditory signals can also be used to provide timing information (similar to a metronome) to give a runner a target cadence during a run. In addition, or alternatively, the auditory signal may include a change in a pitch, or speed of a musical composition being played to a user depending upon the actual cadence of a user with respect to a target cadence). By providing this practically real-time feedback, the athlete is able to make quick adjustments to their gait during the run.” <i>New Balance</i> at col. 11:12-20</p> <p>“In one embodiment, a shoe may have one or more control elements embedded therein to adjust an element of the shoe. For example, control elements may be embedded in the sole of a shoe to adjust a stiffness, flexibility, and/or thickness of the sole in response to a signal received from a remote source.” <i>New Balance</i> at col. 21:30-35</p> <p>B. JP2012228568 “The feedback provided to the user typically includes training information such as, for example, whether the user</p>

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1.e. and either:

send a signal to any of the output devices, instructing the decision maker with feedback related to one or more control factors measured against one or more set points;

or

send a signal to any of the movement devices, controlling said movement devices based on said analysis.

meets certain training criteria and / or training criteria. In embodiments, the provided feedback can be audio feedback, visual feedback and / or biofeedback.” *Adidas* at p. 2 of the translation document

C. US8845494

“Alternatively, when set in automatic control, the data from the sensor 910 representing the leg motions in the gait cycle may **dictate the rhythmic auditory cue rate to which the patient can attempt to adhere.**” *Whitall* at col. 10:34-37

D. US9226706

“The **Comparator evaluates numerical differences between Body and Core Activity Targets and the movements and activity of the body and core of the user and feedback is provided to the user.**” *Alert Core* at cols. 7:67-8:3