TEACHING AND AIDING INTERACTIVE APPAREL

Applicants: Taze Jordan Ellis, Sacramento, CA (US); Uchenna V. Dike, Sacramento, CA (US)

Inventors: Taze Jordan Ellis, Sacramento, CA (US); Uchenna V. Dike, Sacramento, CA (US)

Appl. No.: 14/566,655

Filed: Dec. 10, 2014

Publication Classification

Int. Cl.
A41D 1/00 (2006.01)
A43B 3/00 (2006.01)

U.S. Cl.
CPC .............. A41D 1/002 (2013.01); A43B 3/0005 (2013.01)

ABSTRACT

The demand for earlier independence among children, greater functional independence by the disabled, confident living by the adult aloof, and longer independent living by the elderly is increasing among individuals, family members, and society. Proper apparel use is a key part of independent living. Interactive apparel incorporates static and dynamic Indicators, Manipulators, and devices integrated within or positioned in, on, or about apparel to teach and aid wearers in initiating and maintaining proper apparel function and fashion. Disclosed is interactive apparel to teach and aid proper use without undue situational and apparel knowledge, without undue physical demands, and without undue secondary action.
FIG 6

610 Integrated, Fixed, or Built-In Device

620 Internal Insertable and Removable Device

622 Footwear purchased with device inserted

630 External Attachable and Removable Device

632 Device attached to any footwear

640 Energy charged

650 Any Footwear of pair placed on a foot

670 Footwear delivers no signal for a set time.

672 Timed Out Before Next Footwear Placement?

674 Teaching message to human sense to add or change footwear

682 Left on Left and Right on Right?

684 Teaching message repeated for set timed cycles

686 Proper wear is detected

692 Device remains on for other functionality

694 Device is off

Teaching message output to human sense or senses
FIG 7

710 Integrated, Fixed, or Built-In Device

720 Internal Insertable and Removable Device

730 External Attachable and Removable Device

722 Footwear purchased with device inserted

740 Energy charged

750 Test transmission then detection between footwear

754 Add reflective material

752 Transmission Reflective Footwear?

760 Any Footwear of pair placed on a foot

762 Footwear with Active Device?

764 Footwear delivers no signal

760 Second footwear of the pair placed

782 Left on Left and Right on Right?

784 Teaching message to human sense to add or change footwear

786 Teaching message repeated for set timed cycles

790 Proper wear is detected

794 Device is off

792 Teaching message output to human sense or senses

732 Device attached to any footwear

770 Footwear delivers no signal for a set time.

772 Timed Out Before Next Footwear Placement?
Apparel with one element of a pair of static Manipulators

The apparel is a glove

Jacket is on and glove is placed on a hand and attachment attempted to indicate proper wear

Did static Manipulators of sleeve and glove match?

No

Try the other glove of the pair to affirm the correct static Manipulator

Complete attachment of both gloves

Apparel is properly worn by teaching and aiding

Yes

Complete jacket closure with original jacket closures or other static Manipulators.

Apparel with the other of a pair of static Manipulators

The apparel is a jacket sleeve

Apparel with matching guiding static Manipulators

The apparel is a jacket closure

Jacket is on and closure is attempted

Did static Manipulators of the left and right side closure match?

No

Move up or down one apparel closure to find the correct static Manipulator

Yes

1030

1032

1034

1036

1038

1040

1042

1044

1046

1048

1050

1052

1054

1056

1058

1060

1062

1064

1066

1068

1070

FIG 10
Dynamic Manipulator is attached to apparel

For example, the apparel is a jacket

An Interfacer of the dynamic Manipulator identifies the unique signature by input or scanning

In input mode, the Interfacer is associated with the dynamic Manipulator

The jacket is now identified by the dynamic Manipulator

For example, the jacket is cotton, black, with blue trim

The Interfacer reads the dynamic Manipulator and communicates to human senses

Do the dynamic Manipulators allow for match judgment?

Do the dynamic Manipulators indicate match?

Yes

The Interfacer indicates the degree of match and suggests a degree for new selection.

No

Proper apparel wear has been taught and aided
TEACHING AND AIDING INTERACTIVE APPAREL

CROSS-REFERENCE TO RELATED APPLICATIONS
[0001] This application claims the priority of U.S. Provisional Application with Application No. 61/910,687, Docket Number ELLIS-T-LZ.001PP, EFSID 17542052 titled "Children's Learning Tool for Placing Footwear On Correct Foot" filed on Dec. 2, 2013, the entire contents and substance of which are hereby incorporated in total by reference.

STATEMENT REGARDING FEDERA"LY SPONSORED RESEARCH OR DEVELOPMENT
[0002] Not applicable.

REFERENCE TO A SEQUENCE LISTING
[0003] Not applicable.

BACKGROUND OF THE INVENTION
[0004] 1. The Field of the Invention
[0005] Interactive apparel created with Indicators, Manipulators, and devices integrated within or placed in, on, or about articles of apparel for the teaching and aiding personal function and proper apparel function and fashion.

[0006] 2. Problem Statement
[0007] The pace, priority, and perspective towards basic functions of life are evolving. The expectation of all human beings from the individual them self, to family members, employers, to all aspects of social interactions continue to rise. Clothing becomes an important part of each person fulfilling their potential, accomplishing tasks, being adequately protected, expressing personal preference, being protected and maintaining health. As integral as clothing is to the existence and success of an individual, the incorporation of additional capability, data gathering, information delivery, task support, safety, personal expression, and more is expanded by the incorporation of interactive components into apparel. Those components may be active or passive, such as Indicators and Manipulators; such as containing electronic to gather wear and situational data, provide information to the wearer or care giver, change the character of the apparel, and ensure proper use, function, fashion, or their combination.

[0008] One such area is the greater expectation is with the least capable in our society to perform basic tasks such as clothing them self. Three examples show the simple task of clothing and how Indicators, Manipulators, and devices can aid any user in achieving proper clothing function, fashion, or a combination of function and fashion.

[0009] As a first example, busy parents are spending less instructional time to train younger children on the proper use and function of apparel. One of many specific examples is the challenge of children to meet parental expectation in putting on their own footwear. Important enough is this function to be performed independently by the young child that footwear design has evolved to include simple child capable closure methods that are now common in footwear design for all ages of people. These closure methods however do not overcome the continued problem of children not putting the correct footwear on the appropriate foot, which requires higher cognitive skills and knowledge.

[0010] A second class of examples includes a broad group of children through adults of all situations having physical, mental, emotional, or other conditions that prevent them from achieving proper apparel use in personal performance and apparel function, fashion, and their combination. One of many examples includes the newly blind. It can take months to years for the newly blind to reach a level of confident functionality beyond highly controlled, assisted, or defined circumstances, such as movement outside the home, narrow attire, simple tasks, etc. Any apparel aids that assist and educate will contribute to accelerated function and confidence in daily personal performance, preference, and apparel demands.

[0011] Another of many examples of this second group includes autistic individuals who are being asked by those around them and society to reach further into independent function within their particular condition. Central to independent function is proper use of apparel. Teaching and aiding apparel that assist the autistic in reaching greater personal performance. Using interactive clothing will dramatically contribute to their personal performance, appropriate personal expression, and their proper apparel functional use, fashion, and their combination for greater independence. Available solutions for this class of examples are not universally available, affordable, and easily used. The life of this group of individuals remains tethered to the support of so many other care givers, family members, organization, and support systems.

[0012] Of many potential examples, one more is an emerging area of individual, familial, and social concern. The increasing age of the population and it increasing percentage of the population for the decades to come is demanding solutions specific to the unique needs of the elderly. As with other examples discussed, daily apparel challenges are on the rise and persist longer as the elderly often seek to extend their independent living even further into later years. The challenges of the elderly can include physical, mental, and emotional concerns. One of many examples faced by this population group of our society is the loss of mental and cognitive function at different levels and for so many. Often with limited living resources and for other reasons, having Indicators, Manipulators, or devices capable of use with any apparel that is already owned and appreciated is an important feature to the success of these individuals. Apparel that teaches, aids, and cues for better personal performance, personal expression, independent living, and proper apparel function, fashion, and their combination are important in facilitating longer independent, confident, safe, and quality living.

[0013] There can always be specialized, costly, and narrowly applicable apparel or support to assist individuals or various conditions and abilities. Important to the advancements disclosed is the ability to apply one or more and any combination of Indicators, Manipulators, and devices in, on, or about any apparel item or combination of items the wearer may already have, uses, or obtains to facilitate greater apparel teaching and aiding for proper apparel function, fashion, their combination and improved personal performance, personal expression, and their combination. Specialized apparel are also included in the advancements discussed with the inclusion of Indicators, Manipulators, and devices integrated with the apparel.

[0014] A benefit of Indicators, Manipulators, and devices used with apparel for teaching and aiding in improved personal performance, personal expression, and proper apparel function and fashion is the benefit of teaching by successful repetition or aiding into success for any individual. A problem
for many with sufficient cognitive function but other limitations to achieve more full life ability, is a lack of enough independent repetition and practice to achieve more full personal performance, personal expression, and apparel use ability. Ultimately, because of using interactive, teaching, and aiding apparel, the improved personal performance, personal expression, and learned use of apparel for proper function, fashion, and their combination lead to being able to function with any apparel with or without interactive capability for even greater quality and success in life.

[0015] The above examples are not exclusive to their particular scenario. Each example is inclusive of all ages, ability, and condition of an individual. Take for instance a person recovering from a head injury, a cognitively limited individual, or an elderly person that may be becoming forgetful or less cognitive of their surroundings. Each of these individuals may behave almost child-like in the high chance of wearing the wrong footwear on the wrong foot. The use of interactive apparel may be preferred by fully functional adult who wishes to monitor an maintain a certain heart rate during exercise or athletic event that does not permit for pulse monitoring by hand, but which can be achieved by interactive apparel. Again, what is claimed are Indicators, Manipulators, and devices that teach and aid in the proper use of apparel for any condition, any user, and any apparel item.

[0016] Current apparel functional design and use cues are inadequate. The result is frustration to the individual, whether a child, high functioning autistic adult, normal functioning personal, or the elderly who at some point in appear use may or may not senses improper apparel use. Beyond frustration is the inadequacy, discomfort, and even harm of the apparel when not properly used as designed and intended.

REVIEWED ART

[0017] Attempts have been made in prior art to design assistant apparel, but each is associated with one or more limitations, such as requiring existing knowledge that would then negate the need for the assistance anyway. The need for a threshold of physical ability that is not feasible for children, autistic, blind, or other informed. Other physically or cognitively limited individuals, or the elderly with less cognitive faculties. What is lacking are Indicators, Manipulators, or devices placed in, on, or about apparel to create interactive apparel that teaches and aids personal performance and expression as well as proper apparel function, fashion, and their combinations without requiring full knowledge or physical ability now required by individuals. The state of the art is reviewed below.

[0018] The most commercially viable interactive consumer oriented apparel is the Le Chai interactive footwear by Anirudh Sharma defined by two pending U.S. patent applications 20140266570 A1 and 20140266570 A1. Sharma discloses footwear designed to give direction to a wearer by using GPS navigation in conjunction with haptic feedback inside footwear. The directional guidance is provided by vibrating in the left footwear to turn left and vibrating in the right footwear to turn right. The Le Chai does not address the rudimentary needs of interactive apparel for proper educating and aiding in proper apparel function on the individual. Primarily the Le Chai requires three technologies: the footwear haptic device, Global Positioning System (GPS) connectivity, maps with sufficient detail to identify street level features. Further the Le Chai is not suitable for use within limited space of a home, care center room, or other space where the accuracy of GPS and mapping systems are often ineffective. The device is bulky and not suitable if the desired footwear cannot accommodate the device, such as a sandal, woman’s dress shoe or heeled shoe, if a person’s size is different from that of the device, to name a few conditions. This technology is limited to footwear. For physical reason where sensitivity at the foot may be limited, such as diabetic state or other medical conditions, or for reasons of personal interest and preference, this application does not accommodate the use of the advancement for use in other apparel, accessories, or tools.

[0019] Intelligent Textiles and Clothing (Woodhead Publishing Series in Textiles) Hardcover, Aug. 11, 2006 edited by H. Mattila is an authoritative guide to the near state of the art in interactive and intelligent apparel. 21 of 25 chapters of the book discuss the state of technology in terms of materials adaptable to clothing, sensors, stimulus responsive materials, and other material and technology developments. Chapter 21 discusses interactive textiles and apparel for health assistants, chapter 22 for pre-hospital emergency care monitoring, chapter 23 discusses healthcare textiles for children, and chapter 24 again for wearable biofeedback systems for joint motion. Missing from the developments expressed in this state of the art compilation are applications directed for personal performance and preferences, as well as teaching and aiding at the level of individual, family member, and local caregiver. That is apparel not directed towards monitored disease states or requiring a medical environment, diagnostic equipment, and professional interpretation to name some listed constraints.

[0020] The Human Dynamics Lab at the MIT Media Laboratories pioneered the idea of technology enable apparel to create a socially enabled network. They call it Big Data using “wearable computing” and implementing “machine learning.” Other areas of emphasis include: fashion and art (decorative LED combinations), branding and personal billboards, entertainment, military and civilian communications, health and data logging, and gaming and controllers. As a leading force in wearable technology, what is missing is not “machine learning” and “big data” networks through wearable clothing, but individual support for personal learning and aiding as a result of interactive apparel directing individuals for personal performance and preference, as well as proper apparel function, fashion, and their combinations.

[0021] U.S. Pat. No. 7,246,455 to Covington et al discloses a children’s footwear with aids to enable putting footwear on the correct feet. The footwear incorporate visual and auditory cues to enable the child. The shortcomings in this design are threefold. Required is the necessity to touch the visually and “engaging portion” of the footwear at the toe and the heel at the same time to close the electronic circuit to sense if the correct sides of the footwear are being worn. In contemplation of small children, autistic or sight impaired children or adults, or the elderly who at all likely suffer from motion and dexterity issues, the difficulty of getting proper orientation for closing the circuit with toe and heal placement is impractical. Further the disclosure requires the use of a pressure sensitive switch requiring the footwear to be placed on the foot and then a standing action to confirm placement, and again while stabilizing individuals expressly with impairments is not useful. Thirdly, this disclosure sought only to seek a solution for children, where today’s social needs are evolving to individuals of all ages and condition. Again, what is needed are Indicators, Manipulators, and devices that provide for proper personal performance and preference as well as apparel func-
tion and fashion use and their combinations without requiring often impractical levels of physical ability.

[0022] U.S. Publication No. 2010/0039239 to Ibetoh et al also discloses a focus on child footwear with aids for proper footwear placement. Emphasis is placed on "kids footwears for identifying sides and size." The needed solution for teaching and assisting a child, as well as any individual remains unsolved as footwear placement occurs usually by sitting on the floor often for children or at some elevation in a chair for adults without full pressure weight on the footwear. The pressure sensitive switch used in this disclosure, and as disclosed elsewhere, again requires at least standing and even the function of the footwear to create enough weight to activate pressure sensors of proper footwear placement. Further the limitation again for apparel focused on children is too narrow for today's, needs for independent function now being required of individuals of all ages of any physical, mental, emotional, or other limitation. This disclosure by Ibetoh requires that the child know which foot is the right foot and which foot is the left foot. The disclosure only provides a solution of indicating that a particular footwear needs to be on either the right or left foot, but does not guide or train which foot that is. Such knowledge is required of the child. Additionally, the primary claim of this disclosure is additionally limited to the function of sizing the footwear. The problem being addressed in this disclosure is teaching and aiding where there is little contextual knowledge.

[0023] U.S. Pub. N. US 2006/0013801 A1 to Williams et al discloses the use of recordable devices that are positionable at unique locations. One such message could be "left" with a corresponding location on a left appendage article of clothing such as the left foot. A corresponding device, "right" message, and right footwear placement can also exist. Required by this disclosure is the knowledge of which appendage is left and which is right. Not all children or not all individuals with cognitive limitations due to any condition of ability, disease state, or age will always possess the ability upon prompting to know which is the left and which is the right appendage or article of clothing with the recorded message. What is missing is apparel that teaches and aids from a condition of limited to no knowledge of placement or orientation.

[0024] A few more comments on the shortcomings of needing previous levels of knowledge, such as what is a left or right appendage. Current disclosures do not address teaching or learning and aiding for children before they possess knowledge to effectively used disclosed methods. What is needed are teaching and aiding devices to impart knowledge, habit, and skills needed. Current disclosures that require existing knowledge are inadequate across the range of the high to the totally impaired individuals due to conditions of birth, disease, accidents, age, or a host of other physical, mental, emotional, or other associated and contributing factors.

[0025] Additionally disclosures that require physical ability and dexterity are not be feasible for high to low physically functioning individuals due to conditions of birth, disease, accident, age, or a number of other reasons whether children, adults, or the elderly.

[0026] Using individuals as nodes in an experimental or social network is outside the scope of a child, a lower functioning individual, or the elderly in needing interactive apparel for teaching and aiding at the moment or giving direction and assistance needed to improve personal performance and preference as well as apparel function, fashion, and their combinations. Data logging apparel for physical motion or health condition monitoring requiring instrumentation for data download, manipulation, and display, as well as the need for professional interpretation is not what the learning child or low functioning individual needs for confident apparel use.

[0027] In summary of the disclosures and state of the art, it can be seen that although attempts have been made in assistive and technology laden apparel, to this date each disclosure falls short of needed utility. Shortfalls include needing previous levels of high knowledge to effectively extract utility, having a threshold level of physical ability or dexterity, are limited to children when our social needs now require support across all ages, and the class of disclosures that are not so much intended for the individual but for professionals, institutions, and data Manipulators.

BRIEF SUMMARY OF THE INVENTION

[0028] This disclosure is useful in specifically addressing the use of interactive apparel with one or more or any combination of Indicators, Manipulators, and devices in, on, or about the apparel for teaching or aiding where full situational knowledge is not required, but may be present and useful. This disclosure is directed towards the moment teaching and aiding is needed and most impactful, as well as teaching and aiding for proper initial and ongoing use of apparel that is on or near the wearer.

[0029] Teaching and aiding interactive clothing is necessary to meet the increasing awareness and expectation of individuals for sooner and longer independent living, which includes rudimentary tasks such as proper use of apparel for function, fashion, and their combinations, as well as increase personal performance, preference, and expression. This disclosure is useful for all individuals whether children of all ages and stages of being a child, to older children and adolescence, adolescence to young adult, adults of all ages, to the elderly and all conditions of the informed, diseased, and ability limited due to physical, emotional, mental, or any human condition of limited ability.

[0030] This disclosure is useful in addressing not having or needing a full state of knowledge or cognitive ability associated with apparel use, association, function, and fashion that may result from any condition whether it has not yet been gained, it is intermittent, it is partial and without full use, it cannot be assembled usefully or regularly, it is available but confidence or recognition no longer makes it reliable, there is a lack of interest or attention to make it reliable, knowledge has been lost, or any other of many reasons or loss of partial to full physical, mental, emotional, cognitive, or other ability.

[0031] This disclosure is useful in many cases so that it does not require unreasonable physical dexterity, coordination, or ability is not required or not understood. Such conditions and awareness can be experienced at all ages and with various diseased states.

[0032] This disclosure is useful at the level of the individual where apparel is to be worn, used, or available for the benefit of the individual and the Indicators, Manipulators, and devices are useful for others fully or partially assisting the individual.

[0033] The above conditions translate into examples of application that can be combined into brief examples of application for understanding, but not intended to be limiting to the application of disclosure.
Footwear is an early application of the advancements. In this disclosure, footwear is enabled with a device to teach and aid children, the disabled, and other adults and the elderly in placing and registering the footwear on the proper foot. A just stated this is done without the need for a threshold level of knowledge, but by self registry among the device components to signal that the footwear is properly or improperly placed. Shown are three device applications. One such devices of electronic componentry is integrated in the footwear, where the footwear provides for the housing and positioning of components for stimulus input and stimulus output for human sensory notice. Another example shows the device being accommodated by the footwear with compartments, but accommodated in a way that the device can be removed and placed in another accommodating footwear, such as for different styling, new sizing, and use conditions. A further example of the device is a device that reside on the surface of the footwear.

Taking this same device, other application can be created to include a bracelet, a cane, or a hand held device that provide directional cues, position detail or other instruction to improve personal performance, express preference, and provide for apparel function, fashion, and their combination.

This disclosure is directed to the teaching and aiding in the proper use, function, fashion, and their combination of apparel. This also include the use of Manipulators. These are passive devices such as closures that compel certain articles of clothing to be assembled in an exact way or with certain other apparel to ensure proper function, fashion, and their combination. A more specific example includes a unique closure or matching snaps that requires a jacket to be properly closed or a certain glove to be worn with the jacket and on the correct hand by matching the sleeve fastener, and as such to teach and aid any individual of any capacity to gain proper apparel function and fashion. Similar to a Manipulator is an Indicator. These provide guidance in the assembly of apparel for gaining proper function, fashion, or their combination, but do not compel compliance. Indicators can be as simple as a message note, or use of QR labels and codes with a reader to indicate approval or disapproval of the combination of certain apparel items. This teaching and aiding is useful to broaden the wardrobe of the blind, color blind, or less cognitive aware, or other that prefer a professional guidance to apparel combinations for proper function, fashion, and their combinations.

The invention may be more fully understood by reference to the following drawings and detailed description.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The objects, features, and advantages of the present invention will become apparent from the following accompanying drawings and reference to the following detailed description:

FIG. 1 is a perspective view of Teaching and Aiding Interactive Apparel in a disclosure of an external and removable device showing footwear that self registers for proper left footwear on left foot and right footwear on right foot by orientation for a transmitter and sensor relationship that initiates relaying a message at the individual level that affirms proper footwear wear without the wearer having to take further physical action of standing or movement, or other action.

FIG. 2 is a perspective view of Fixed or Built-In Integrated Device For Active Teaching And Aiding Interactive Apparel is a disclosure that self registers for proper left footwear on left foot and right footwear on right foot by orientation for a transmitter and sensor relationship that initiates relaying a message at the individual level that affirms proper footwear wear without the wearer having to take further physical action of standing or movement, or other action.

FIG. 3 is a perspective view of Internal Insertable and Extractable Device For Active Teaching And Aiding Interactive Apparel is a disclosure view of an internal and removable teaching and aiding interactive apparel showing footwear that self registers for proper left footwear on left foot and right footwear on right foot by orientation for a transmitter and sensor relationship that initiates relaying a message at the individual level that affirms proper footwear wear without the wearer having to take further physical action of standing or movement, or other action.

FIG. 4 is a perspective view of External Attachable and Detachable Device For Active Teaching and Aiding Interactive Apparel is the same as figure one with specific components described and showing device relationship with a second footwear and potentially adding a reflective surface enabling a single device use attached to one of the footwear in the pair.

FIG. 5 is a block diagram of Device Schematic For Active Teaching And Aiding Interactive Apparel for integrated, internal removable, or external removable devices for proper footwear registration teaching and aiding disclosures for the receipt of stimulus from input components such as, but not limited to user interfaces, sensor, or transmission receipt for driving user teaching and aiding indicators such as, but not limited to audio sound or phrases, visual indicators, haptic Indicators, positioning information to the user or observers, among other possible functionality readily design by person's or ordinary skill in the art.

FIG. 6 is a flow chart of Active Device With Transmitter And Detector With Different Footwear For Teaching And Aiding Interactive Apparel illustrating a method of teaching and aiding by interactive apparel.

FIG. 7 is a flow chart of Active Device With Transmitter And Detector With The Same Footwear For Teaching And Aiding Interactive Apparel illustrating a method of teaching and aiding by interactive apparel.

FIG. 8 are perspective views of Passive Shape Snap Fasteners For Teaching And Aiding Interactive Apparel are formed to affix to standard apparel and using one or more fasteners in one or more locations on the apparel to required specific matching of the opposing fastener member creating teaching and aiding of proper apparel assembly and wearing, based on apparel function, fashion, or the combination.

FIG. 9 are perspective views of Passive Fasteners For Teaching And Aiding Interactive Apparel are formed to affix to standard apparel and using one or more fasteners in one or more locations on the apparel to required specific matching of the opposing fastener member creating teaching and aiding of proper apparel assembly and wearing, based on apparel function, fashion, or the combination.
FIG. 10 is a block diagram of Static Manipulators With Apparel For Teaching And Aiding Interactive Apparel illustrating a method of teaching and aiding by static Manipulators creating interactive apparel.

FIG. 11 are top views of Readable Information Labels For Teaching And Aiding Interactive Apparel are created to withstand the lifecycle of apparel and provide apparel specific and associated information that provide teaching and aiding in the proper function, fashion, or combination use.

FIG. 12 is a block diagram of Dynamic Manipulators With Apparel For Teaching And Aiding Interactive Apparel illustrating a method of teaching and aiding by dynamic Manipulators creating interactive apparel.

DETAILED DESCRIPTION OF THE INVENTION

The objects, features, and advantages of the present invention will become apparent from the following description of preferred disclosures given in conjunction with the accompanying drawings.

With respect to the descriptions of interactive apparel enabled by Indicators, Manipulators, and devices are considered enabling, but also illustrative examples of the principles of the invention which may take various forms and alterations while keeping with what is described and claimed. Further since numerous modifications and changes can readily occur to those persons having ordinary skill in the art for devices, Manipulators, Indicators, apparel, and other elements of the invention, it is not intended for that which is described and illustrated as current preferred disclosures to limit the invention in any way to the exact construction and operation. All suitable modifications and equivalents may be resorted to falling within the scope of the invention.

This disclosure is useful in specifically addressing the use of interactive apparel using one or more or any combination of Indicators, Manipulators, and devices in, on, or about the apparel for teaching or aiding where full situational knowledge is not required, but may be present and useful. This disclosure is directed towards the moment teaching and aiding is needed and most impactful, as well as teaching and aiding for proper initial and ongoing use of apparel that is on or near the wearer.

Teaching and aiding interactive clothing is necessary to meet the increasing awareness and expectation of individuals for sooner and longer independent living, which includes rudimentary tasks such as proper use of apparel for function, fashion, and their combination. This disclosure is useful for all individuals whether children of all ages and stages of being a child, to older children and adolescence, adolescence to young adult, adults of all ages, to the elderly and all conditions of the infirm, diseased, and ability limited due to physical, emotional, mental, or any human condition of limited ability.

This disclosure is useful in addressing not having or needing a full state of knowledge or cognitive ability associated with apparel use, association, function, and fashion that may result from any condition whether it has not yet been gained, it is intermittent, it is partial and without full use, it cannot be assembled usefully or regularly, it is available but confidence or recognition no longer makes it reliable, there is a lack of interest or attention to make it reliable, knowledge has been lost, or any other of many reasons or loss of full physical, mental, emotional, cognitive, or other ability.

This disclosure is useful in many cases where unreasonable physical dexterity, coordination, or ability is required or not understood that is experienced at all ages and with various diseased states.

This disclosure is useful at the level of the individual where apparel is to be worn, used, or available for the benefit of the individual and the Indicators, Manipulators, and devices are useful for others fully or partially assisting the individual.

Apparel is referring to all elements associated with an individual’s being that may be placed on, with, around, or in proximity to the individual and for all occasions and situations. So intertwined is apparel and accessories, that accessories and apparel are included in the definition of apparel. Accessories will be those items with a localized apparel influence. All occasions and situations that provide covering, protection, fashion, personal interest, function, accessorizing, personal tools and assistance, for daily activity, for sport, for health and medical reasons, for professional reasons, and all other possible individual uses. It includes footwear, clothing, outer coverings, outer or inner device carrying harnesses, walking canes, walking staffs, blind walking and notice canes, baton, handheld device, attachable device, anklets, bracelets, necklaces and necklace based devices, head coverings, eye glasses, and other items that provide for apparel or the person’s function, fashion, or their combination.

Function of apparel refers to the proper use, orientation, wear, and all other considerations of the apparel that it is worn as intended and achieves the intended benefits. Only by way of example, but not limited to being worn properly, proper selection of apparel for the situation, apparel used to improve personal performance, among so many other situations, and their combinations, currently known or developed by users and persons having ordinary skill in the art.

Personal performance extends the utility of teaching and aiding of interactive apparel. Apparel is recognized for its integral contribution to situations such as overcoming disabilities, fostering and aiding in healing, assisting in mobility, reduction of pain, preventing health issues and injury, supporting sports performance, aiding in stamina, mobility, and now into the realm of navigation, body function monitoring, and so many other functions, and their combinations.

Fashion of the apparel refers to any interpretation or attribute the wearer may ascribe to the apparel with regard to aesthetic consideration in terms of materials, color, design, texture, cut, pattern, sense of personal delight, expression of personal preference, other considerations, and their combinations. This is not an invention of the apparel, but ensuring that any functional and fashion qualities of the apparel or opinion of the wearer or society are achieved for the apparel. Only by way of example, but not limited to combining textures, color, pattern, cut, design, and other considerations of wearer or socially accepted interest.

Apparel Use is often used and is inclusive of apparel function, fashion, and their combinations.

A benefit of the disclosure is teaching and aiding from repetition and practice that translates knowledge and habits gained to personal performance and preference expression as well as other apparel not fitted with Indicators, Manipulators, or device. Such individual achievement is the utility of this disclosure to accelerate, improve, and increase longevity of independent and increased normal living and personal, family, and social function.
The disclosure refers to using one or more or a combination of Indicators, Manipulators, and devices that themselves are customizable to the level of teaching and aiding functionality required, desired, or a combination of need by the wearer or their circumstances. Only by way of example, a blind wearer may not desire visual communicators on a pair of footwear, but may require haptic or audio communicators. In contrast a diabetic may not have sensation in the extremities and visual and audio communicators are required and desired.

The interactive device disclosed refers to an entity that takes one or more inputs from non-human sources and human sources, manipulates input stimulus, and creates one or more outputs sensed by the wearer to provide teaching and aiding for the proper function, fashion, change in personal performance, preference expression, and their combinations. The interactive device may be of any construction being electronic based, optical based, or any other form. The disclosure uses a preferred disclosure uses electronics and facilitating components and accessories known or to be developed by persons having ordinary skill in the art to create the disclosed teaching and aiding utility. The invention looks to persons having ordinary skill in the art in using known or developed microprocessors; memory; detectors and sensors; signal and impulse transmitters and receivers; signal and impulse emitters; human input interfaces of buttons, key pads, speech, device transfer; human interfaces of acoustic, visual, and haptic forms; and other electronic components required of this disclosure and their assembly and coding to create the disclosed utility as determined by apparel, use conditions, wearer preference, apparel function, apparel fashion, needed performance, and their combinations.

Indicators and Manipulators include design and structure of the full range of mechanical, chemical, electrical, electronic, acoustic, thermal change, material properties (material state, shape memory, shape change with impetus, non-magnetic to magnetic, non-adhesive to adhesive, non-conductive to conductive, and all other), color, texture, solid, woven, in forms that can be rigid or flexible, or other properties used by Indicators or Manipulators singularly or any combination. Indicators are used solely for sensory purposes that cue proper apparel use or in combination with apparel function and fashion design. Indicators do not prohibit the improper use of apparel, but indicate proper or improper use. Only by way of example, and not limited to the following, Indicators include colors, textures, sizing, tags with barcode or QR codes that allow information deliver to improve function and fashion matching or cue to personal performance and preference expression but instruction could be violated. Indicators include other visual, audio, haptic, or physiological communicators to the wearer. Indicators are used to create notice, guide, and suggest proper apparel use or personal performance guidance. Manipulators can include Indicators but also include features that prohibit, limit, or make difficult the improper use of apparel to guide proper use, function, fashion, personal performance, and preference. Only by way of example and not an exhaustive list, includes sensors that indicate proper use are snaps with unique design that only allow exact matching for proper closure or proper appendage use, shape specific closures, buttons and holes of different sizing than those adjacent, and more. Manipulators are used to create notice, guide, and seek to compel proper apparel use.

The disclosure is the creation of Indicators, Manipulators, and devices with one or more or a combination to be placed in, on, about, or a combination of placements with apparel to guide or compel functionality to teach and aid in the proper function, fashion, or their combination of function and fashion and to improve personal performance and preferences with full knowledge and cognitive ability or without undue knowledge, less than full cognitive awareness, and undue physical dexterity. Personal performance includes the use of interactive apparel to limit the affect of a disability, to achieve greater sports function, obtain greater stamina in sport or throughout a work day, monitor body response to climatologically conditions, monitor and improve health, even moving from physical application into emotional and mental well being and to provide confidence and conviction.

Stimulus Input are referred to throughout this disclosure and include inputs from non-human and human sources. Non-human sources include all forms of detector inputs; sensor inputs; signals from other device using radio frequency, infrared frequency, radar, radiation, sound wave protocols, other signal know and discovered by those having ordinary skill in the art, and their combinations. Stimulus inputs also include information from detectors and sensors of the nature of light intensity and magnitude, light change conditions, pressure magnitude and change, thermal change, electrical voltage or current change, electronic sources, sound wave, stress and strain gauges, and other sensors and detectors that interface with the physical world, and their combinations. Stimulus Inputs also include those from human sources and device interface of keypads, buttons, switches, plugs, tethered, and remote, from smartphones, a cellphones, IPOD, IPAD, tablet device, laptop computer, TV, game console, GPS transmitters and receivers, or any such device that can be capable of communicating and their combinations and all components, coding, protocols for human interaction or for communication to other devices.

Stimulus Output is also referenced throughout this disclosure and include human awareness communicators, such as audio, visual, and haptic communications and their combinations. The term human awareness is used as the interactive apparel may be interacting with individuals that have lost one or more sense totally or regionally on the body, do not understand one or more sense, and other such reasons. The term human awareness is used to also indicate that just because a noise is made does not mean that it is registered to the awareness of the individual. This term human awareness accounts for interactions that lead to an awareness in the wearer. Stimulus Output means the necessary electronics commonly known to persons having ordinary skill in the art of electronics and other device construction assemble all the needed components to create the audio, visual, and haptic stimulus output. Stimulus output also means registry on smartphones, a cellphones, IPOD, IPAD, tablet device, laptop computer, TV, game console, GPS transmitters and receivers, or any such device that can be capable of communicating and their combinations and all components, coding, protocols for human interaction or for communication to other devices.

Interactive Apparel for Teaching and Aiding

The invention may be more fully understood by reference to the following drawings and detailed description. Hereinafter, interactive apparel for teaching and aiding will be described in detail with reference to the accompanying drawings.

FIG. 1 is a perspective view of teaching and aiding Interactive Apparel as applied to footwear. This image pro-
vides a contextual overview how a device used to convert everyday apparel into interactive apparel with the capability of teaching and aiding a wearer or assistant on the proper use and function of the apparel, or footwear as in this figure. This figure represents the use of a device that can be moved from one apparel item to another. More specifically this disclosure of an external and removable device showing footwear that self registers for proper left footwear on left foot and right footwear on right foot. The teaching and aiding is created by orientation of a transmitter and detector relationship that completes the system information circuit and initiates relaying a message at the individual level that affirms proper footwear wear with the wearer needing little preexisting orientation knowledge, without having to Stand or take further movement, or other action.

FIG. 2 is a perspective view of fixed or built-in integrated device for active teaching and aiding interactive apparel and in this case illustrative in the form of footwear. This image provides a contextual overview how a device used to convert apparel into interactive apparel with the capability of teaching and aiding a wearer or assistant on the proper use and function of the apparel, or footwear as in this figure. In this disclosure, the position of elements are integrated in, on, or about the footwear. The position of elements described are placed for visual effect and discussion, but may be position in, on, and about the footwear as may be functionally required or as may be desired for reasons of preference or fashion. The teaching and aiding is created by orientation of a transmitter and detector relationship that completes the system information circuit and initiates relaying a message at the human acknowledgment level that affirms proper footwear with the wearer. As the transmitted signal is diffuse and detectors receive a diffuse signal, there is no need for unusual accuracy or physical dexterity and need for little preexisting orientation knowledge, and not need to stand or take further physical movement, or other action. The discussed disclosure is relevant to footwear, but persons having ordinary skill in the art will readily recognize that other variation can be further applied to footwear to other apparel and accessories.

Right footwear 200 and left footwear 202 represent apparel in the form of footwear applicable to any form chosen for device integration. The current disclosure is not directed to characteristics of a particular current or unforeseen future footwear design but focused on the integration of a device that teaches and aids in the apparel use function, fashion, and their combination. It is left to persons having ordinary skill in the art of footwear design and construction to alter the footwear to which this disclosure applies.

Visual Emitter 204 works in conjunction with component output interfaces to provide affirming or nonaffirming teaching an aiding in proper footwear. One or more or a combination of visual emitters is disclosed. A visual emitter is a light emitting diode. In other disclosures a visual emitter is a light bulb, a flash bulb, a glow bulb, light crystals, laser, a color change film, a colorful patch, or any other means of active or dynamic color change as known or developed by persons having ordinary skill in the art. The visual emitter communicates to the visual sense of the wearer that the footwear is correctly or incorrectly worn, as known or developed by persons having ordinary skill in the art.

Haptic Interface 206 works in conjunction with component outputs to provide affirming or nonaffirming teaching and aiding in proper placement of footwear. One or more or a combination of haptic interfaces is disclosed. A haptic interface is a piezoelectric x, x-y, or x-y-z motion; large magnitude elongation; rotation; oscillation; pressure wave; thermal change; other action noticed by human senses as known or developed by persons having ordinary skill in the art. In other disclosures a haptic interface is a motor, an electric pulse, or other communication by haptic senses recognized by the wearer. Any haptic interface communicators may include one or more or a combination of communications that may be steady, pulsed, increasing, or any form of amplitude, frequency, and timing as known or developed by persons having ordinary skill in the art.

Audio Emitter 208 works in conjunction with component output interfaces to provide affirming or nonaffirming teaching and aiding in proper placement of footwear. In the current disclosure, the audio output interface includes a speaker. By combination of the interactive device, component output interfaces and audio output interfaces audio communication is sensed by the wearer. The audio output being one or more or a combination of a noise, sound, word, words, phrases, their communication, their sequence, repetition, or other communication known or developed by a person having ordinary skill in the art. Memory and other recordable device components allow for a prerecorded or alterable statement to be delivered as an audio option. The audio emitter in other disclosures include a buzzer, piezoelectric, tone maker, clicker, or other audio communicator known or developed by persons having ordinary skill in the art. One or more or a combination of audio interfaces are permissible as needed by features of the disclosure.

204, 206, and 208 provides for one or more and any combination of component output interfaces as may be functionally necessary, required by the individual, desired as a preference, or by other election.

Human Input Interface 210 discloses the use of one or more or a combination of wearer input interfaces to provide interactive device control, wearer preference, control by remote device connectivity, or other means to control the teaching and aiding of proper apparel function, fashion, personal performance, or their combination. In the disclosure the wearer input interface is button depression switches. In other disclosures the wearer input interface occurs by slider switches, toggles, touch points, slides, or any local or remote wearer to device communication components known or developed by persons having ordinary skill in the art.

Microprocessor and Energy Source 212 provides for inputs to register proper apparel use and select outputs for the teaching and aiding of proper apparel use by wearers by way of components and structure known or developed by persons having ordinary skill in the art. In this disclosure the device is in the form of electronics, but includes any device construction, such as optical, simple circuits, or other construction known or developed by persons having ordinary skill in the art. The device includes an energy source that defined to be integrated energy storage in the device and recharged by an external power source, or may also include interchangeable energy storage, energy cell or any portable energy source and enabling components known or developed by persons having ordinary skill in the art. A interactive device having circuitry and processing capability separate or integrated and defined as micro circuitry, integrated circuits, chips, microchips, micro processors, computers, memory, cache, and related enabling code, wiring, or any form of connectivity, processing, and support items known or developed by persons having ordinary skill in the art of connectiv-
ity and processing. An interactive device possessing needed controls for proper function and for inputs and outputs. Component input interfaces and component wearer input interfaces will be discussed in subsequent treatments. Component output interfaces and component wearer output interfaces will be discussed in subsequent treatments. A component input interface is an electronic or other non-human entity and supportive entities that provides stimulus to the interactive device, receives stimulus from the device, or otherwise facilitates needed function of the interactive device, as known or developed by persons having ordinary skill in the art. Component and wearer input or output interfaces of the disclosure include one or more or any combination of any form of tethered or untethered remote communication to or from the device for proper function as known or developed by persons having ordinary skill in the art. For example, a smartphone, a cell phone, IPD, IPAD, tablet device, laptop computer, TV, game console, or any such device that can be used to interact with a device having one or more or any combination of all such energy source, circuitry, processing, inputs, outputs, interfaces, or components as needed or desired for enabling interactive apparel for teaching and aiding proper apparel function and fashion. An interactive device may contain all or part of needed functionality for interactive apparel teaching and aiding for function and fashion as one or more and a combination of a single interactive device, paired interactive devices such as a transmitting and receiving pair, or use with other unrelated devices that interact with the interactive device for input or output function.

Pressure Detector 214 discloses the use of one or more or any combination of detectors that indicate a change in condition with the apparel as component input interfaces for device function and control. In the disclosure the detector is a pressure change detector that indicates the footwear is worn due to the foot in the footwear changing the pressure to the detector. In other disclosures the detector registers a change in light, heat, electronic, or other properties due to actions of stress, strain, compression, elongation, or other detectors know or developed by persons having ordinary skill in the art. The position of the detector may be placed so that no additional action by the wearer is required, such as standing, walking, or other motion to change pressure, although such actions are not included. A part of the connector or interactive device for this and other inputs, there may be a timer to turn on or off the energy source to the detector until a threshold change is sensed, reserved for only the moments after initial use, or cycled on and off for intermittent readings, respond to wearing direct action, or other patterns of use or their combinations.

Light detector 216 was just discussed, but is specifically included. One or more or any combination of light change detectors are used to indicate a change in condition with the apparel as component input interfaces for device function and control. The disclosure discloses the use of a phenomena change detector. In the disclosure the detector is a light change detector that indicates the footwear is worn due to the foot in the footwear changing the amount of light to the detector. In other disclosures the detector registers a change in thermal signature, various frequencies, of radiation, pH change, chemical reactivity, or other detectors know or developed by persons having ordinary skill in the art. A change in condition detector as disclosed does not require the wearer to take additional steps such as standing to add pressure on the detector for stimulus to be generated and registered by the interactive device. A part of the connector or interactive device for this and other inputs, there may be a timer to turn on or off the energy source from the device or turn the interactive device on or off as required by function, use conditions, preference, and fashion.

Switch 218 discloses the use of one or more or a combination of manual or automated contacts with the appliance as component input interfaces for device function and control. Disclosed is the use of a connector with the closure of the footware. In other disclosures the connector is a switch, conductive surfaces, or other known or developed contacts by persons having ordinary skill in the art. A part of the connector or device may be a timer to turn on or off the energy source from the device or turn the interactive device on or off, or turn individual components of the interactive device on or off as required.

214, 216, and 218 provides for one or more and any combination of component input interfaces as may be elected by the particular features of the disclosure.

Antenna 220 is one or more or any combination of antenna and related components for transmission and reception of remote stimulus. The antenna and related components provides for remote device input to the interactive device to include, but not limited to functional control, stimulus from detectors, or other stimulus or information input as known or developed by persons having ordinary skill in the art. The antenna and related components provides for interactive device output to remote devices to include, but not limited to one or more or any combination of audio, visual, haptic, physiological communication or other stimulus or information output to wearer senses as known or developed by persons having ordinary skill in the art.

Transmitter 222a and Receiver 222b provides for an interactive apparel that does not require rigorously precise orientation and difficult physical positioning of the legs and feet, subsequent actions for use such as standing or walking, and does not require previous apparel knowledge. Transmitter 222a of footwear 200 and receiver 222b of footwear 202 detect proper orientation or spatial positioning with the transmitter and receiver oriented so that signal is given and gained then proper function of the footwear is registered. The transmitter and receiver can be operated by means of radio frequency, light, radiation, infrared, sound wave, and their combinations or other known or to be discovered signal and sensor by persons having ordinary skill in the art.

Aside from the variations explained with this disclosure or other variations disclosed, anyone having ordinary skill in the art will recognize that other variations of what has been disclosed are possible without deviating from the spirit and scope of the invention. By way of examples and not limited by the scope of the example the following are presented. The device can be aggregated with multiple input and output functionality or constructed to the most simple single input, output, or combination. Audio output can include a sound, word, phrase, or combination. Using a buzzer rather than a speaker would allow the microprocessor of 214 with it's associated memory for sound to be eliminated, thus eliminating the microprocessor for more simplified circuitry. Likewise with visual effects. The device of 214 could contain...
outputs for a single or plurality of lights, LEDs, or other emitters at various regular or random frequencies. A simplified device eliminating light control could be used to provide a light with a steady glow when a switch is closed. A simplified device could also provide for a blinking light by using a flasher bulb rather than a bulb. Similar examples could be made for any aspect of the device ranging from complex and multifunctional to simplified and singular while remaining within the scope and context of the invention.

[0087] Further the disclosed footwear apparel is an example of application and the example is not intended to be limiting to footwear, but also indicative of apparel generally where the device is in integrated with the apparel to train and aid in proper function and fashion. Persons of ordinary skill in the art may appreciate that numerous design configurations and applications range from possible to produce the functional benefits of the inventive systems in other applications. Thus given the wide variety of configurations and arrangements of disclosures of the present invention the scope of the present invention is reflected by the breadth of the claims below rather than narrowed by the disclosures described above. It will be appreciated by those of ordinary skill in the art that modifications can be made to the structure and elements of the invention without departing from the spirit and scope of the invention as a whole.

[0088] The Interactive Device detailed in FIG. 2 is considered the Device referred to throughout this disclosure and claims. This same device is show to take on different forms and flexibility in function described in FIG. 3, FIG. 4, and elsewhere and it would be recognized by persons having ordinary skill in the arts that these variations occur without departing from the definition of the Device as illustrated in FIG. 2 and throughout this application.

[0089] FIG. 3 is a perspective view of an internal insertable and extractable device for active teaching and aiding interactive apparel. This disclosure is illustrated by application to footwear.

[0090] As seen in this disclosure a general interactive device would be obtained and used in footwear produced or modified to receive it. In the present disclosure just one of the articles of footwear would need to be modified with signal transmission and reception being initiated and received by the same device to indicate that the left foot is in the left footwear and the right foot in the right footwear. In this application the transmitted signal will be reflected back to the detector for sensing. Other forms of the disclosure could include two interactive devices each in one of the articles of footwear pair. In any form of the present disclosure the interactive device is extractable and insertable in a different article of footwear.

[0091] This is a utility of significance with the current disclosure as exchange with other footwear will be needed with change in footwear size, consumption of the footwear, taste change, or any other reason that the interactive device is simply extractable and insertable in the next pair of footwear of interest. This disclosure or with modification could be used with other apparel. Important to the disclosure is the utility of a transmitted and received stimulus initiating and relaying a message sensed at the individual level that affirms proper footwear wear without the wearer have to undergo undue preexisting orientation knowledge of the apparel, without having to stand or make further physical movement, or other action, although such additional movement or actions are not excluded.

[0092] The disclosure is in the form of two units, an interactive device and an energy source. A disclosure may be contained in a single unit, the two unit form shown, or elements separated into any number of other single or multiple use units, each tethered, remotely connected, or tethered and remotely connected and insertable and extractable from the footwear or other apparel. In this disclosure, the position of elements are integrated in, on, or about the units. In this disclosure the position of elements described are placed for visual effect and discussion, but may be position in, on, or about the unit and in units positioned within and about the footwear as may be necessary or desire for proper apparel and interactive device function, fashion, performance, preference, or their combination.

[0093] Specifically, in this disclosure, 300 is a charging port for the energy source unit which may alternatively be positioned on the energy source, or the energy source could be a holder for interchangeable batteries or other sources of energy. 302a is a signal transmitter. 302b is a signal receiver. 304 is a visual emitter. 306 is an audio port for audio emitting from internal to the unit, a plug in connector to an audio unit, or positioned more on the surface of the unit. 308 is an external facing detector input. 310 represents an extension of the unit such that it protrudes through a hole in the apparel or side of the footwear at the sole or other locations as may be preferred for the particular disclosure. 312 is the interactive device. 314 is a detector component input for light, pressure, or other stimulus. 316 is a haptic output interface. 318 is an energy source. 320 is functional and user inputs. The device of this disclosure is the collection of all or part of the elements discussed in FIG. 2 as required by the particular purpose and features of the Extractable and Insertable device disclosure and with each elements having equivalent properties as previously discussed. The specific location of the discussed elements and the particular configuration of the device is show as an example, without intent to restrict placement of components discussed and the general configuration of the device, but that these may change based upon the size of the footwear or apparel areas of use, preference, use conditions and need.

[0094] One insertable and extractable interactive device unit may incorporate all needed elements to perform the function of the disclosure with the opposing footwear having inherent or affixed sufficient reflectivity to return the signal to be detected by the single unit. Another disclosure includes the insertable and extractable interactive device units have all or part functionality with one unit transmitting a signal and another unit in the other footwear pair receiving the signal. One or more or a combination of a single unit, pair of transmitting and receiving units is within this disclosure to achieve the purpose teaching and aiding interactive apparel showing footwear that self registers for proper left footwear on left foot and right footwear on right foot by orientation for a transmitter and sensor relationship. The completed signal circuit initiates relaying a message at the individual level that affirms proper footwear wear without the wearer have to need any preexisting orientation knowledge, without having to taking further physical action of standing or movement, or other action.

[0095] This discussed disclosure is relevant to footwear, but persons having ordinary skill in the art will readily recognize that other variation of the type previously discussed can be applied to footwear and other apparel.

[0096] FIG. 4 is a perspective view of a preferred disclosure of an external attachable and detachable device for active
teaching and aiding interactive apparel. This disclosure is illustrated by application to footwear.

The utility of the present disclosure is self registration of apparel wear for proper left footwear on left foot and right footwear on right foot by proper orientation of a transmitter and sensor relationship. With a completed signal circuit that initiates relaying a message sensed at the individual level that confirms proper footwear wear without the wearer having to need any preexisting orientation knowledge of the apparel, without having to take further physical action of standing or movement, or other action, although such additional movement or actions are not excluded.

This disclosure expresses a preferred embodiment for many wearers as the interactive device is attachable and detachable to apparel as the wearer deems necessary. This disclosure does not require component integration in the apparel or apparel manufactured or modified to accommodate the unit. Only by way of example and not limited to this example, but this disclosure shows how a wearer’s existing apparel can be used and in some cases and at some point the interactive device may not be needed for continued proper apparel use, function, fashion, personal performance, preference, and their combinations. Other forms of the disclosure could include two interactive devices each on one of the articles of the footwear pair. In any form of the present disclosure the interactive device is attachable and detachable from a different article of footwear.

Significant with the current disclosure is the simple ability to attach and detach the interactive device to other footwear for change in footwear size, consumption of the footwear, taste change, or any other reason of need or interest. This disclosure or with modification could be used with other apparel and accessories. Important to the disclosure is the utility of a transmitted and received stimulus initiating and relaying a message sensed at the individual level that confirms proper footwear wear without the wearer have to need undue preexisting orientation knowledge of the apparel, without having to stand or make other physical movement, or other action, although such additional movement or actions are not excluded.

This disclosure is in the form of a unit containing the interactive device and an energy source. The attachable and detachable device may be contained in this single unit form shown, a two unit form, or elements separated into any number of other single or multiple use units, each tethered, remotely connected, or tethered and remotely connected and positioned on or about as attachable and detachable from the footwear or other apparel. In this disclosure, the position of elements are integrated on or about units with the footwear. In this disclosure the position of elements described are placed for visual effect and discussion, but may be position in, on, or about the unit and in units positioned within and about the footwear as may be functionally desired or necessary or as may be desired or required for reasons of fashion, performance, and preference.

Specifically in this disclosure, 400 and 402 represent the footwear of a pair where either could contain the device or the interactive device set. 404 is a charging port for the energy source, but could include other charging or replacement elections. 406 is a visual emitter. 408 is the functionality and wearer interface. 410 is the audio emitter. 412 is a switch located under the interactive device that detects that the footwear is just being worn. For visual reasons, it is indicated on the tongue of the shoe, but can be of any configuration, such as a clip on the back side of the attachable and detachable device that slides under the shoe closure (laces, straps, etc.) and resides closely against the top of the foot and houses both the Indicator that the device is being worn, but also any haptic interface that would be felt on the top of the foot. 414 is the interactive device containing one or more and combination of functionality of component inputs and output interfaces, wearer inputs and outputs, and elements disclosed to provide teaching and aiding of proper apparel function, fashion, or a combination. 416 is a signal transmitter to provide a stimulus to be detected when apparel is in proper proximity and position and then from which teaching and aiding communication will be provided. 418 is a reflective surface inherent with the apparel and footwear in this drawing or affixed to the apparel to ensure sufficient signal reflection for detection. 420 is a detector for receiving the transmitted stimulus available when the apparel is in proper proximity and position. 422 and 424 are nonhuman stimulus, input ports. 426 is an antenna for transmission and reception of stimulus for control, function, interfacing, and other communication with the interactive device is contained within the case of the device. The device of this disclosure is the collection of all or part of the elements discussed in FIG. 2 as required by the particular purpose and features of the disclosure and with such elements having equivalent properties as previously discussed.

A central utility of the invention is teaching and aiding for proper apparel use, function, and fashion and improved personal performance and preference expression without undue knowledge, say of what is left and what is right. As with previous art, there is some prior preparation by those cognizant to do so. There is the purchase of the footwear for the child, the insertion of the GPS ready technology in the left shoe for the blind so the left signal properly registers, and so on. Such is the case with the disclosure of this disclosure. Placement of the interactive device on the correct footwear and with the correct orientation is required of the wearer. In the definition of the wearer this includes an individual assisting the wearer, be they the wearer, family, friends, guardians, caregivers, and any other that renders assistance. It is also known that the wearer may be able to properly attach and orient the interactive device on the footwear with the ability to hold the interactive device and footwear closer to their eyes and with time for inspection and get the correct orientation, where with the footwear at a distance such is not feasible and the interactive device then insures proper apparel function and fashion. Once the interactive device is properly positioned on the footwear then proper orientation is achieved without undue situational knowledge. The occasional assistance by other with the wearer does not negate the central utility of the disclosure of the wearer properly utilizing the apparel correctly time and time again without the assistance of other, but with the teaching and aiding of the interactive device. Note that the attachable and detachable interactive device can be placed upon either article of the footwear pair. Required is simply the rotation of the device to ensure the stimulus transmitter and stimulus receivers are directed towards the other article of footwear of the pair.

One attachable or detachable interactive device unit may incorporate all needed elements to perform the function of the disclosure with the opposing footwear having inherent or affixed sufficient reflectivity to return the signal to be detected by the single unit. Another disclosure includes the attachable and detachable interactive device units have all or
part functionality with one unit transmitting a stimulus and another unit on the other footwear pair receiving the stimulus. One or more or a combination of a single unit, pair of transmitting and receiving units is within this disclosure to achieve the purpose of teaching and aiding interactive apparel showing footwear. With proper orientation, then there is self registry for proper left footwear on left foot and right footwear on right foot by orientation for a transmitter and sensor relationship that initiates relaying a message at the individual level that the wearable is worn without the wearer having to need any preexisting orientation knowledge, without having to take further physical action of standing or movement, or other action.

[0104] This disclosure is relevant to footwear, but persons having ordinary skill in the art will readily recognize that other variation can be applied to footwear and other apparel. The attachable and detachable device is most directly convertible to other apparel and accessory uses. This device with some simple case modification and repositioning of components can be designed for use with other apparel, can be held as a teaching and aiding tool, could take the form of a walking cane, or other device.

[0105] FIG. 5 is a block diagram of the interactive device and elements when integrated, inserted, attached, or about apparel, creating interactive apparel that teaches and aids in proper apparel function, fashion, performance, or combination of function and fashion. The block diagram illustrates the ability of the interactive device to change in its functionality and to include all needed elements within the device to receive stimulus, manipulate stimulus, deliver stimulus, and further amplify or convert that stimulus in to wearer sensed communications. Persons of ordinary skill in the art may appreciate that numerous design configurations may be possible to produce the functional benefits of the inventive systems. It will be appreciated by those of ordinary skill in the art that modifications can be made to the structure and elements of the invention without departing from the spirit and scope of the invention as a whole.

[0106] The interactive device and its elements have been previously described in greater detail with FIG. 2. Disclosed is a more feature comprehensive interactive device, to illustrate a fuller capacity for interactive apparel, but does not express all available features or express simplified or single purpose interactive devices.

[0107] The energy charging unit 500 is energy source 502 dependent. The power control 504 acts as a switch to energize the interactive device. A power timer 506 manually, automatically, or situationally determines the start, duration, level, and termination of energy to the interactive unit and elements. A power time 506 may also be included in individual components for their specific functionality. The microprocessor 520 provides the manipulation of inputs and outputs from elements of the interactive device to coordinate and create the functionality of registering proper apparel function, fashion, improved personal performance or their combination. Memory 530 is integral to electronic function. Signal transmitter 532 provides for delivered stimulus to facilitate proximity and position detection. Signal receiver 534 is included in the single interactive device capable of stimulus transmission and return of signal stimulus for reception to achieve needed teaching and aiding functionality. Functional Indicators 536 provide awareness of the operation of the interactive device and ability to choose among available interface and control device features. Expansion input space 538 provides for feature requirements or choices that may change based upon the apparel.

[0108] Recordable Audio 550 is a component with audio input interface 550a to record sounds, words, phrases, noises, and other audio communications ultimately delivered and processed for stimulus output. Microprocessor 520 delivers to audio output component 552a and then audio amplifier 552b and electronic to wearer interface is made through the audio emitter 552c to communicate to the sense of the wearer. Microprocessor 520 delivers to visual output component 554a and then visual amplifier 556a and electronic to wearer interface is made through the visual emitter 554a to communicate to the sense of the wearer. Microprocessor 520 delivers to haptic output component 556a and then haptic amplifier 556b and electronic to wearer interface is made through the haptic interface 556c to communicate to the sense of the wearer. Microprocessor 520 delivers to vector output component 558a and then vector amplifier 558b and electronic to wearer interface is made to the vector interface 558c to communicate to wearer or wearer assistant information about the position of the interactive device and hence the position, movement, direction, rate, and other spatial information about the wearer. Signal Receiver 534 represents components necessary to receive any form of stimulus be it originating from the transmitter of the interactive device or other transmitters from satellite signals, local area networks, laser, infrared frequencies, radio frequencies, and other forms known or developed by persons having ordinary skill in the art. The receipt of vector data is accomplished by received signals, components, coding, stored mapping, and other elements. Additional output space 560 allows for the variety that is a part of the device depending upon use conditions, function, preference, and need. Operator input 570 allows for wearer specific information for optimal teaching and aiding of apparel function and fashion use. Functional Manipulator 572 provides for interactive device control, feature selection, and wearer specific use. The housing 580 shows it to be inclusive of part of the elements, but it may or may not contain all the elements depending upon functional need, use conditions, preference, and other considerations or all considerations.

[0109] A person having ordinary skill in the art would readily appreciate the inclusion or exclusion of elements of the device based upon functional need, preference, and other considerations. The block diagram of FIG. 5 is an example of one preferred configuration, to provide an interactive device for teaching and aiding apparel function, fashion, or function and fashion without aspects of previous apparel or contextual knowledge.

[0110] FIG. 6 is a flow chart of an active device with transmitter and detector with different footwear illustrating a method of teaching and aiding by interactive apparel. This flow chart represents the use of the interactive device as applied in FIG. 2, FIG. 3, and FIG. 4 as integrated, inserted and extractable, and attachable and detachable configurations. In this flow chart there are two devices used, with a transmitter device in one of the footwear pair and the receiver device in the other. It is seen that the components and function of the three configurations readily achieve teaching and aiding the wearer of proper apparel use, function, fashion, improve personal performance, or any combination of the same. The flow chart is again applied to the footwear as the relevant apparel. It is readily seen to those having ordinary
skill in the art that taking one or two of the devices in their current configuration or with some modification the flow charts remain similarly applicable to other apparel and accessory applications.

[0111] The first form of disclosure is the integrated, fixed, or built-in interactive device and footwear 610 is readied with a charged energy source 640. An absolute of this first disclosure is that the orientation of the stimulus transmitter and the stimulus receiver will have the proper orientation to ensure proper footwear use. The second form of disclosure is the internal insertable and removable interactive device 620 is inserted in footwear made for the device 622 and then energy charged 640 and readied for use. The act of inserting the device in the footwear has the beneficial result of orienting the device to the proper second article of the footwear pair. There is likely no misidentification of which article of the pair the insertable interactive device should go, in a single device application or even with an interactive device is in each shoe. The third form of disclosure is the external attachable and removable interactive device 630 is interactive device attached to any footwear 632 and then energy charged 640 and readied for use. As previously mentioned the interactive device 630 needs to be positioned in proper orientation.

[0112] With footwear readied with interactive devices integrated in the footwear, inserted in the footwear, or attached to the footwear and having a ready energy source, then any of the footwear pair articles can be put on the foot 660. A condition is tested that the footwear is placed on the wrong foot and the footwear delivers no signal 670. The footwear now being an article of interactive apparel senses a delay in decision making program 672 into the interactive device to wait for the next article of footwear in this case. If the second article of footwear is not placed on the foot before the delay ends, then a teaching message to wearer sense (audio, visual, haptic, or their combinations) to add the footwear 684 is communicated. If the second article of footwear is placed 680 on the second foot and the association of the footwear is incorrect 682, then there will be the same effect as if the footwear was not placed as it was not detected and the delay 672 before a teaching and aiding response will end. A teaching message to the wearer sense (audio, visual, haptic, or their combinations) to change the footwear 684 will be given. In either case the wearer will have enough cognitive awareness to know that the other article of footwear must be worn or that the footwear must be changed from the current foot to the other foot. Changing footwear to the other foot does not require knowing what is the left foot, the right foot, the left footwear, or the right footwear achieving the utility of the disclosure. Step 660, 670, 672, and 684 of the interactive device test will again occur as well as the 680, 682, and 684 interactive device test will again occur as many times as needed. The cycle of footwear teaching and aiding placement will continue with at least some cognitive awareness to quickly achieve proper footwear use, function, and fashion.

[0113] With proper wear detection 690 a teaching message output to wearer sense 692 (audio, visual, haptic, or their combinations) will be communicated to teach one or more affirmations to the wearer. Depending upon the functionality chosen by the wearer the device will be turned off 694 or the device will remain on for other functionality 696.

[0114] The teaching and aiding of interactive apparel is accomplished without undue situational knowledge, undue physical dexterity and coordination, and undue additional action to active the interactive device such as standing to apply pressure. The progression of use is illustrative and it is clear from wide human experience in wearing footwear and apparel, that additional or less detail, and modification can be made without departing from the scope of what is described and claimed. It will be clear to persons having ordinary skill in the art that such modifications or more or less detail do not change the actual and intended utility. The scope of the present invention is reflected by the breadth of the claims below rather than narrowed by the disclosures described above. It will be appreciated by those of ordinary skill in the art that modifications can be made to the structure and elements of the invention without departing from the spirit and scope of the invention as a whole.

[0115] FIG. 7 is a flow chart of active device with transmitter and detector with the same footwear for illustrating a method of teaching and aiding by interactive apparel. This flow chart represents the use of the interactive device as applied in FIG. 2, FIG. 3, and FIG. 4 as integrated, inserted and extractable, and attachable and detachable configurations. This flow chart represents the functionality with only one interactive device used per pair of footwear. The needed element for proper function is footwear with outer material that will return a transmitted stimulus or a temporary to permanent reflective surface added as shown by 418. It is seen that the components and function of the three configurations readily achieve the teaching and aiding the wearer of proper apparel use, function, fashion, or any combination of the same. The flow chart is again applied to the footwear as the relevant apparel. It is readily seen to those having ordinary skill in the art that taking one or two of the devices in their current configuration or with some modification the flow charts are similarly applicable to other apparel.

[0116] The first form of disclosure is the integrated, fixed, or built-in interactive device and footwear 710 is readied with a charged energy source 740. An absolute of this first disclosure is that the orientation of the stimulus transmitter and the stimulus receiver will have the proper orientation to ensure proper footwear use. The second form of disclosure is the internal insertable and removable interactive device 720 is inserted in footwear made for the device 722 and then energy charged 740 and readied for use. The act of inserting the device in the footwear has the beneficial result of orienting the device to the proper second article of the footwear pair. There is likely no misidentification of which article of the pair the insertable interactive device should go, even with an interactive device in each shoe. The third form of disclosure is the external attachable and removable interactive device 730 is interactive device attached to any footwear 732 and then energy charged 740 and readied for use. As previously mentioned the interactive device 730 needs to be positioned in proper orientation.

[0117] With footwear readied with interactive devices integrated in the footwear, inserted in the footwear, or attached to the footwear and having a ready energy source, then a test transmission is conducted between footwear 750 can be tested. If the transmission reflective footwear 752 test fails to deliver enough detectable stimulus within the distance of footwear placed next to each other to the distance that an adult can span their feet while sitting and standing, then adding reflective material 754 will follow. The 750 and 752 test will recur.

[0118] With footwear that returns a transmitted signal the footwear pair article can be put on the foot 760. One pair of the footwear has the interactive device and the other does not
If the footwear without the interactive device is placed on the foot then there will be no signal and no wearer (audio, visual, haptic, or their combinations) 764. The second footwear will then be placed on the second foot 780. If the footwear are placed on the wrong feet then there will be a time out from the time the footwear is activated and when it does not receive a return signal. The condition is tested that the footwear is placed on the wrong foot due to the time out and the footwear delivers no signal causing a teaching message to be delivered to the wearer senses (audio, visual, haptic or their combinations) 784. The teaching message will continue until the device senses a change or for a set period of time 786. Footwear are then reapplied 760. If the wrong footwear is placed again on the wrong foot then the above cycle will be repeated. If the footwear with the interactive device is placed then there is a set time where there is no signal 770. There is a test if the device senses a signal from the reflective surface, or that the second shoe was applied 772. If there is a time out then a teaching message is given to add the second footware 784. If the second footwear is placed then there is a test if it is the right footwear on the right foot 782. If the second article of footwear is placed 780 on the second foot and the association of the footwear is incorrect 782, then there will be the same effect as if the footwear was not placed as it was not detected and the delay 772 before a teaching and aiding response will end. A teaching message to the wearer sense to change the footwear 784 will be given. In either case the wearer will have enough cognitive awareness to know that the other article of footwear must be worn or that the footwear must be changed from the current foot to the other foot. Change footwear to the other foot does not require knowing what is the left foot, the right foot, the left footwear, or the right footwear achieving the utility of the disclosure. Step 760, 770, 772, and 784 interactive device test will again occur as well as the 780, 782, and 784 interactive device test will again occur. The cycle of footwear teaching and aiding placement will continue with at least some cognitive awareness to quickly achieve proper footwear use, function, and fashion.

With proper wear detection 790 a teaching message output to wearer sense (audio, visual, haptic or their combination) 792 will occur to teach one or more affirmations to the wearer. Depending upon the functionality chosen by the wearer the device will be turned off 794 or the device will remain on for other functionality 796.

The teaching and aiding of interactive apparel is accomplished without undue situational knowledge, undue physical dexterity and coordination, and undue additional action to activate the interactive device such as standing to apply pressure. The progression of use is illustrative and it is clear from wide human experience in wearing footwear and apparel, that additional or less detail, and modification can be made. It will be clear to persons having ordinary skill in the art that such modifications of more or less detail does not change the actual and intended utility. The scope of the present invention is reflected by the breadth of the claims below rather than narrowed by the disclosures described above. It will be appreciated by those of ordinary skill in the art that modifications can be made to the structure and elements of the invention without departing from the spirit and scope of the invention as a whole.

GPS Enabled Apparel

Further detail of FIG. 1, FIG. 2, FIG. 3, and FIG. 4 the following GPS enabled interactive device or device is discussed.

Consistent with some embodiments of the present disclosure, a haptic feedback based apparel may include at least one microprocessor unit configured to control at least one operation of the apparel, at least one battery configured to provide a power supply voltage, and at least one Radio Frequency (RF) unit configured to communicate with at least one external electronic device using at least one wireless communication protocol. The apparel further includes at least one oscillation motor configured to generate at least one pattern of oscillation, at least one movement detector (movement detector), the at least one movement detector further including at least one magnetometer configured to provide at least one reading indicative of orientation.

In another embodiment, a system for human computer interaction using one or more of haptic apparel, may include at least one external device configured to communicate with a first apparel and a second apparel. The first apparel and the second apparel may each include at least one microprocessor unit configured to control at least one operation of the apparel, at least one battery configured to provide a power supply voltage, and at least one Radio Frequency (RF) unit configured to communicate with at least one external electronic device using at least one wireless communication protocol. The apparel further includes at least one oscillation motor configured to generate at least one pattern of oscillation, at least one inertial motion unit (movement detector), the at least one movement detector further including at least one magnetometer configured to provide at least one reading indicative of orientation.

In another embodiment, a haptic feedback based apparel may include at least one microprocessor unit configured to control at least one operation of the apparel, at least one battery configured to provide a power supply voltage, and at least one Radio Frequency (RF) unit configured to communicate with at least one external electronic device using at least one wireless communication protocol. The apparel further includes at least one oscillation motor configured to generate at least one pattern of oscillation, at least one movement detector (movement detector), the at least one movement detector further including at least one magnetometer configured to provide at least one reading indicative of orientation.

Additional features and advantages of the invention will be set forth in part in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The features and advantages of the invention will be realized and attained by the elements and combinations particularly pointed out in the appended claims.

In the following description and claims, the terms "coupled" and "connected," along with their derivatives, may be used. It should be understood that these terms are not intended as synonyms for each other. Rather, in particular embodiments, "connected" and/or "coupled" may be used to indicate that two or more elements are in direct physical or electronic contact with each other. However, "coupled" may also mean that two or more elements are not in direct contact with each other, but yet still cooperate, communicate, and/or interact with each other.
The Interactive Device with its haptic interface is a tactile feedback mechanism that takes advantage of the sense of touch by applying forces, oscillations, or motions. It should be understood that the various functional units individually or in any combinations, may be implemented in hardware, in software executed on one or more hardware components (such as one or more processors, one or more application specific integrated circuits (ASIC’s) or other components), or in a combination of hardware and software.

As has been shown and understood that in practice there may be any number of wearable units. Therefore, the present disclosure is not limited in the number of wearable units that may be included and/or supported by an haptic interaction system consistent with the disclosed embodiments.

Furthermore, the following figures and discussion describe a haptic based interaction system in context of a user wearable system, that is, a system that can be worn on one or more parts of a user’s body. However, it should be understood that the various aspects of the system discussed below is not limited to a user wearable system but can be used in a non-wearable context.

In addition, the following figures and discussion describe a haptic based interaction system as including a mobile unit with a either a fixed or a mobile external device. Therefore, the various aspects of the system discussed below is not limited for use with only mobile external device but can be used with fixed external devices as well.

As is further known the device can communicate wirelessly between antennas of devices and can be coupled together via a wired connection, and can further communicate with each other via a wireless and/or wired connection.

The device can communicate to convey one or more commands and/or signals that can alert the user to perform and/or take one or more actions. Furthermore, the device can also be configured to send one or more commands and/or signals, thereby controlling one or more function and/or operations.

Communication between devices in some embodiments, for example, a smartphone, a cell phone, IPOD, iPAD, tablet device, laptop computer, TV, game console, or any such device that can be capable of communicating via a wired and/or wireless communication protocol. There can also be included a user interface such as one or a combination of one or more of a keypad, a touch screen, a Braille display, voice/speech input, or any such interface that can allow a user to interact with the device. The device can also include a central processing unit and memory. In some embodiments, a computer readable program can be loaded in memory, the computer readable program when executed can configure to communicate with the devices by sending one or more commands/signals and thereby enabling them to perform one or more operations. Furthermore, the computer readable program code can also configure the device to receive one or more commands and/or signals from the devices.

The device can also include a location unit that is capable of computing geographical location based information. For example, device location unit can include a global positioning system (GPS) location sensor (GPS) receiver that can compute location based co-ordinates. In some embodiments, device location unit can also be capable of performing assisted GPS sensor (agps sensor) operations to compute geographical location information. In some embodiments, the device location unit can also include a Wi-Fi receiver and device components can be further configured to compute indoor based location information. For example, in some embodiments, within an indoor facility such as, for example, shopping malls, hospitals, museums, etc., device location unit can be configured to compute location information by triangulating signals received from one or more fixed Wi-Fi transmitters. The computed location information can be used in conjunction with building plan/floor plan/indoor map information etc., to compute location information within the indoor facility.

As further shown the device can further include a Bluetooth technology. As will be discussed in detail below, the device can be configured to communicate with exemplary devices via Bluetooth unit. For convenience, the device is depicted as including a Bluetooth unit. However, it should be understood that in practice, exemplary device can include one or more units that are capable of implementing any wireless communication protocol for communicating with devices, such as exemplary units discussed. Therefore, the present disclosure is not limited to the wireless communication protocols that may be included and/or supported by a mobile unit consistent with the disclosed embodiments.

According to non limiting exemplary embodiments, wearable unit may include a microcontroller unit (microprocessor control unit) that can be coupled to a power unit. In some embodiments, power unit can further include one or more batteries such as, for example, a rechargeable lithium-polymer or lithium-ion battery, a solar cell, or any such device capable of providing electrical power required for the operation of microprocessor control unit and in turn the unit. In some embodiments, power unit can further include a voltage regulator circuit that can be configured to control a voltage supplied from a battery in the power unit to one or more components in device. In some embodiments, power unit can also include a port for plugging in a wall charger to charge the elements of the unit. In some embodiments, power unit can include a port for interfacing with the unit to a computer or an external electronic device, to allow for data transfer to/from unit device and the connected electronic device. In some embodiments, power unit can also include circuitry that can enable the elements of the device to be charged through inductive charging also referred as wireless charging. In some embodiments, power unit can be further coupled to an on/off switch that can be configured to manually turn on and/or off the device. In some embodiments, the switch can also include a pressure sensitive switch. Microprocessor control unit can be configured for processing signals and enabling communication between various elements of the device and in turn with mobile device.

Unit can also include a radio frequency (RF) unit that can be coupled to microprocessor control unit. RF unit can include relevant hardware and/or software components that can allow device to communicate with mobile control. For example, the device can communicate wirelessly with a stimulus input via RF unit by establishing a Bluetooth, infrared, or any such wireless connection that can allow the transfer of data to/from the stimulus input or stimulus output and device. Furthermore, in some embodiments device can also include a secondary RF unit. RF can include a structure similar to RF and can be configured to communicate with one or more additional navigational units. For example, the mobile stimulus input device and device can communicate
with each other via secondary RF unit. Furthermore, in some embodiments, secondary RF unit can be included as part of RF unit.  

The device can also include one or more stimulus input or stimulus output or Actuation Units (AU) coupled to the microprocessor control unit. it should be understood that in practice there may be any number of actuation units. Therefore, the present disclosure is not limited in the number of actuation units that may be included and/or supported by a Wearable unit consisted with the disclosed embodiments.  

Actuation units, such as exemplary stimulus inputs can each be configured to generate one or more indicators (feedback). For example, each can be configured to generate one or a combination of audio, video, and/or haptic feedback. In some embodiments, this can be configured to generate haptic feedback such as a oscillation. Furthermore, in some embodiments, can be configured to generate one or more oscillation(s) of varying intensity and/or, frequency, and/or time duration. In some embodiments, can also be configured to generate one or more oscillation(s) of different patterns, such as, for example continuous oscillation, pulsed oscillation, etc. In some embodiments, information/alerts/ instructions to a user can be conveyed via one or more of activation units. through one or more oscillations.  

During regular operation of device, the stimulus inputs may be actuated on receiving a command and/or signal from mobile stimulus input and output device even called controller. In addition, stimulus inputs may also be actuated by microprocessor control unit. Based on the type of input provided by the user through user interface, the controller can transmit one or more commands/signal to the stimulus inputs and outputs through via Bluetooth Unit and RF unit.  

Some embodiments, the device may also include a Movement detector (movement detector) coupled to microprocessor control unit. In some embodiments, movement detector can include individually or a combination of one or more of an accelerometer, gyroscope and magnetometer, the structures of the various units (accelerometers, gyroscopes, and/or magnetometers) that can be included in movement detector are well known by a person of ordinary skill.  

In some embodiments, movement detector in device can be configured to compute and or detect information related to, for example, position, orientation, header, gestures, motion, acceleration, velocity etc. the information gathered by movement detection can be further transmitted to controller and various event based decision can be further made by controller. as discussed above, controller can send various feedback (such as oscillations) via the device and the device to alert a user about a particular event and/or to instruct the user to perform a particular action. In some embodiments, microprocessor control unit in the device can be configured to be configured to compute and or detect information related to, for example, position, orientation, header, gestures, motion, acceleration, velocity etc., and microprocessor control unit can further generate one or more oscillations via exemplary stimulus output to alert the user about a particular event and/or to instruct the user to perform a particular action.  

In some embodiments, movement detector can be included as a part of controller, and readings from movement detector can be used be used by controller to compute and/or detect information related to, for example, position, orientation, header, gestures, motion, acceleration, velocity etc. In some embodiments, the device can include a pressure sensitive sensor pressure sensor such as a piezoelectric sensor as will be discussed in detail below, the device can be configured to be automatically turned on and/or off via pressure sensor.  

The device can further include an Obstacle Finding Unit (OFU) that can be coupled to microprocessor control unit. the obstacle finding unit can include various hardware and/or software and can be configured to detect and alert the user of the presence of one or more obstacles in their path. in some embodiments, obstacle finding unit can be a standalone unit (separate from the device) that can be coupled to the device through either a wired or wireless connection via rf unit. in some embodiments, obstacle finding unit can be a standalone unit (separate from the device) that can be coupled to controller through either a wired or wireless connection.  

The obstacle finding unit can include a microcontroller unit microprocessor control unit. microprocessor control unit can be similar in structure to microprocessor control unit discussed. it should be understood that in some embodiments, if obstacle finding unit is included as part of the device, microprocessor control unit can then be included in part or as a whole in microprocessor control unit. That is, microprocessor control unit and microprocessor control unit can be one and the same.  

The microprocessor control unit can be further coupled to ultrasonic, that can be configured via microprocessor control unit to transmit ultrasonic pulses of sound, the sound waves transmitted by each of sensors, travel in a path (cone), each of can be further configured to give a distance measure of one or more obstacles that can lie within their respective cone. in some embodiments, by monitoring the data received from one or more of sensors, microprocessor control unit can alert the user via one or more exemplary stimulus inputs can detect the presence of one or more obstacles. for convenience, obstacle finding unit is shown as including three ultrasonic sensors. however, it should be understood that in practice there may be any number of ultrasonic sensors, such as exemplary sensors that can be included in obstacle finding unit. therefore, the present disclosure is not limited in the number of ultrasonic sensors that may be included and/or supported by a obstacle detection system consisted with the disclosed embodiments.  

In some embodiments, by monitoring the data received from one or more of sensors, microprocessor control unit can be further configured to compute a path that can enable the user to avoid the one or more detected obstacles. in this case, microprocessor control unit via one or more exemplary stimulus outputs can guide the user along a path that can help him/her to avoid the one or more detected obstacles. in some embodiments, microprocessor control unit can be configured to transmit readings from sensors to controller, and controller can be further configured to process the reading of sensors, and alert the user to take appropriate action by transmitting commands/signals to the device and/or the device.  

The obstacle finding unit can include microprocessor control unit that is coupled to image and the illumination unit. image sensors can have a similar structure and can be configured to generate scene information in the form of image data. in some embodiments, image sensors can be one or a combination of a camera, an infra-red camera, or any such sensor that can capture visual information. the visual unit or illumination unit can be any light source that can be capable of generating visible and/or infra-red light for illuminating a path to be processed by one or more of sensors. for convenience, obstacle finding unit is shown as including three image sensors and one illumination unit. however, it should
be understood that in practice there may be any number of image sensors and illumination units, such as exemplary image sensors and illumination unit that can be included in obstacle finding unit, Therefore, the present disclosure is not limited in the number of image sensors and/or illumination units that may be included and/or supported by a obstacle detection system consisted with the disclosed embodiments. [0149] the microprocessor control unit can be coupled to sensors, to receive visual information. MCU can be further configured to process data received from one or more of sensors to detect if one or more obstacles lie in the path ahead. In some embodiments, by monitoring and/or processing data received from one or more of sensors, microprocessor control unit can alert the user via one or more stimulus input or stimulus output of the presence of one or more obstacles.

[0150] in some embodiments, by monitoring the data received from one or more of sensors, microprocessor control unit can be further configured to compute a path that can enable the user to avoid one or more detected obstacles. In this case, microprocessor control unit via one or more stimulus outputs can guide the user along a path that can help him/her to avoid the one or more detected obstacles, in some embodiments, microprocessor control unit can be configured to transmit data from sensors to controller, and controller can be further configured to process the data from one or more of sensors, and alert the user to take appropriate action by transmitting one or more commands/signals to the device and/or the device.

[0151] the obstacle finding unit can include microprocessor control unit that is coupled to an image sensor such as exemplary image sensor and a structured light unit or light sensor. For convenience, obstacle finding unit is shown as including one image sensor and one structured light unit, however, it should be understood that in practice there may be any number of image sensors and structured light units, such as exemplary image sensors and structured light unit hat can be included in obstacle finding unit. Therefore, the present disclosure is not limited in the number of image sensors and/or structured light units that may be included and/or supported by a obstacle detection system consisted with the disclosed embodiments. Structured light unit can be a light source that can project one or more light patterns, such as exemplary pattern. For example, structured light unit can be, without limitation, a laser, mirror, micro projector assembly, or any such unit that can be capable of projecting a light pattern on a surface. Structured light unit can be further configured to project either visible light or infra-red light patterns. For convenience, structured light unit is shown as projecting a rectangular grid pattern. However, it should be understood that in practice there may be any number and/or types of patterns, such as exemplary pattern that can be projected by structured light unit. Therefore, the present disclosure is not limited in the number or style of pattern that can be projected by a structured light unit consistent with the disclosed embodiments.

[0152] Image sensors can have a structure similar to that discussed and can be configured to capture image data corresponding to the pattern projected by structured light unit. the microprocessor control unit can be coupled to sensor and structured light unit to receive visual information from sensor, microprocessor control unit can be further configured to process data received from sensors to detect if one or more obstacles lie, in a path ahead. In some embodiments, obstacles can be detected by capturing (via sensor) image data corresponding to a light pattern (such as exemplary pattern) projected by structured light unit and comparing the captured image data with predetermined image data calculated during a calibration process. The differences between the captured image data and the predetermined data can be used to detect the presence of one or more obstacles.

[0153] in some embodiments, by monitoring and/or processing data received from sensor, microprocessor control unit can alert the user via one or more stimulus inputs of the presence of one or more obstacles. in some embodiments, by monitoring the data received from sensor, microprocessor control unit can be further configured to compute a path that can enable the user to avoid one or more detected obstacles. In this case, microprocessor control unit via one or more stimulus outputs can guide the user along a path that can help him/her to avoid the one or more detected obstacles. In some embodiments, microprocessor control unit can be configured to transmit data from sensor to controller, and controller can be further configured to process the data from sensor, and alert the user to take appropriate action by transmitting one or more commands/signals to the device and/or the device.

[0154] the obstacle finding unit can include microprocessor control unit that can be coupled to stimulus inputs such as ultrasonic sensors, image sensor, and illumination unit. sensors, and illumination unit are similar in structure to those discussed. For convenience, obstacle finding unit is shown as including two ultrasonic sensors, one image sensor and one illumination unit. However, it should be understood that in practice there may be any number of ultrasonic sensors, image sensors, and illumination units, such as exemplary ultrasonic sensors, image sensor and illumination unit, that can be included in obstacle finding unit. Therefore, the present disclosure is not limited in the number of ultrasonic sensors, image sensors and/or illumination units that may be included and/or supported by an obstacle detection system consistent with the disclosed embodiments.

in a manner similar to that discussed, microprocessor control unit can be configured to receive a distance measure of one or more obstacles that can lie within the cones of sensors. Furthermore, in a manner similar to that discussed, microprocessor control unit can be configured to also receive visual information from image sensor. microprocessor control unit can be further configured to process data received from one or more of sensors, and to detect if one or more obstacles lie in a path ahead. In some embodiments, by monitoring and/or processing data received from one or more of sensors, and, microprocessor control unit can alert the user via one or more stimulus inputs of the presence of one or more obstacles.

[0155] in some embodiments, by monitoring the data received from one or more of sensors, microprocessor control unit can be further configured to compute a path that can enable the user to avoid one or more detected obstacles. In this case, mcu via one or more stimulus outputs can guide the user along a path that can help him/her to avoid the one or more detected obstacles. In some embodiments, microprocessor control unit can be configured to transmit data received from sensors to controller, and controller can be further configured to process the data from one or more of sensors and alert the user to take appropriate action(s) by transmitting one or more commands/signals to the device and/or the device. In some embodiments, information received from ultrasonic sensors can be used to detect obstacles between knee and head height of a user, while information received from image sensor can be used to detect obstacles below knee height and above head height of a user.
the obstacle finding unit can also include a structured light unit that is similar in structure to that discussed. For convenience, obstacle finding unit is shown as including one structured light unit. However, it should be understood that in practice there may be any number of structured light units, such as exemplary structured light unit that can be included in obstacle finding unit. Therefore, the present disclosure is not limited in the number of structured light units that may be included and/or supported by an obstacle detection system consistent with the disclosed embodiments.

the microprocessor control unit can be configured to receive a distance measure of one or more obstacles that can lie within the cones of sensors. Furthermore, in a manner similar to that discussed, microprocessor control unit can be configured to receive visual information from image sensor that can also include captured structured light pattern data. Microprocessor control unit can be further configured to process data received from one or more of sensors to detect if one or more obstacles lie in a path ahead. In some embodiments, by monitoring and/or processing data received from one or more of sensors, microprocessor control unit can alert the user via one or more stimulus inputs of the presence of one or more obstacles.

in some embodiments, by monitoring the data received from one or more of sensors, microprocessor control unit can be further configured to compute a path that can enable the user to avoid one or more detected obstacles. In this case, microprocessor control unit via one or more stimulus outputs can guide the user along a path that can help him/her to avoid the one or more detected obstacles. In some embodiments, microprocessor control unit can be configured to transmit data received from sensors to controller, and controller can be further configured to process the data from one or more of sensors and alert the user to take appropriate action(s) by transmitting one or more commands/signals to the device and/or the device. In some embodiments, information received from ultrasonic sensors can be used to detect obstacles between knee and head height of a user, while information received from image sensor can be used to detect obstacles below knee height and above head height of a user, and structured light pattern information corresponding to structured light unit and received via image sensor can be used to detect surface features of the path ahead.

A device that can be embedded in a wearable object such as a apparel insole. In some embodiments, insole can operate in a manner similar to the device discussed. The insole can include a microcontroller unit (microprocessor control unit) coupled to a power unit (PU) and a RF unit. Microprocessor control unit can be further coupled to an oscillation motor. In some embodiments, microprocessor control unit, power unit, RF unit, and vibrator can have similar structure and functionality as microprocessor control unit, power unit, RF unit, and Stimulus inputs and outputs, respectively. For convenience the insole as including one actuation unit. However, it should be understood that in practice there may be any number of actuation units, such as exemplary vibrator, included in insole. Therefore, the present disclosure is not limited in the number of actuation units that may be included and/or supported by an insole consistent with the disclosed embodiments. The insole can also include an movement detector coupled to microprocessor control unit. In some embodiments, movement detector can have similar structure and functionality as movement detector, discussed. In some embodiments, power unit can be coupled to an On/Off switch that can be configured to manually turn on and/or off insole. Furthermore, in some embodiments, switch can also be coupled to a pressure sensitive sensor pressure sensor (such as a piezoelectric sensor). Pressure sensor can be configured to provide one or more readings that can correspond to the force exerted on pressure sensor. As discussed above, in some embodiments, pressure sensor can also be used to automatically turn ON/OFF insole. Furthermore, in some embodiments, pressure sensor can also be used to detect various gesture events such as footsteps pressure sensor. In some embodiments, the various units included in apparel can be placed inside a metal or plastic enclosure. The enclosure can be designed in a manner that can protect the various units/components from impact due to the weight of a user or normal wear and tear.

The insole can be inserted into a wearable medium such as a apparel. For convenience, the insole as being inserted in a apparel. However, it must be understood that in practice insole can be inserted and used with any type of footwear, including without limitation, sandals, slippers, flip-flops pressure sensor, etc.

The wearable device can include two insoles L (intended to be worn on the left foot) and R (intended to be worn on the right foot). Insoles L and R are similar in structure and functionality to insole discussed.

The insoles L and R can further communicate with a mobile unit such as exemplary controller. For convenience, the controller as being a mobile phone. However, it should be understood that in practice, controller can be for example, a smartphone, a cell phone, iPod, iPad, tablet device, laptop computer, TV, game console, or any such device that can be capable of communicating with insoles’s L and R via a wired and/or wireless communication protocol. In some embodiments, controller can include computer readable program code which when executed by a processor in controller can configure controller to communicate with insoles L and R to provide navigation and/or orientation information to a user. During regular operation of system A, a user can interact with controller via user interface. For example, a user may set a desired destination he/she intends to travel to. Controller can then via location unit and map data stored in memory compute a route from the users current location to the desired destination set by the user. In some embodiments, controller can be configured to retrieve map data and/or route information via a data connection or a Wi-Fi connection enabled in controller.

In some embodiments, the user can receive feedback related to route information from controller through one or more oscillations in insole L and/or insole R.

In an exemplary embodiment, system A can be used to assist visually challenged individuals to navigate to a desired destination in a safe and independent manner. During normal operation of system A, a user can interact with controller and set a desired destination as discussed above.

In some embodiments, switch included in insole L and R, respectively, can be coupled to pressure sensitive switch. In some embodiments, switch itself can be a pressure sensitive switch. In some embodiments, insole L and R can automatically turn ON when a user wears the insoles. Furthermore, when the user interacts with controller, a Bluetooth connection can be automatically established between insole L, insole R, and controller. In addition, a small oscillation can be felt in both insole L and insole R, to indicate to the user that the system A is connected and ready for use.
Once the computer readable program code on controller has been initialized, location information regarding the user’s current location is received from location unit of controller as was discussed, the location unit can include a pressure sensor receiver. In some embodiments, if a user of system A is indoors, or if a pressure sensor signal is unavailable, controller can also be configured to receive location information using a combination of one or more methods including assisted-pressure sensor (apressure sensor) i.e triangulating controller’s current location by using data received between various cell-towers, and/or using a wi-fi network to calculate location information.

Once a desired destination has been set by a user, controller can compute a route from the user’s current location to the set destination. the user can then place the controller back in his or her pocket or bag, and start walking, direction information pertaining to the calculated route is communicated to the user via one or more oscillations in Insole L and/or Insole R. For example, if the user has to take a left, he or she will receive a oscillation in insole L, and if the user has to take a right, he or she will receive a oscillation in insole R. Furthermore, through different patterns of oscillations, different information can be conveyed to the user. For example, if the user has to take a left turn, a few meters before the turn the user can receive a haptic non-oscillator generator elongation sensation of 0-225 milliseconds (ms) long oscillations or elongations in insole L, near the action point, yet before the turn the user can receive a haptic pulse generator of indistinguishable oscillation or pulse of 550-1000 ms cycles in insole L, and at the exact point of the turn, the user can receive a 1 second oscillation in insole L. A haptic oscillation generator with frequency of oscillations and warming of 275 ms-475 ms is reserved for special notification, even multiple frequencies vibrating at the same time, and where the wearer is more aware of this frequency range. The haptic generators provide stimulus output that creates a motion and notice sensation with the wearer. A haptic generators are inclusive of x directional, y directional, and x-y directional movement. Included in haptic pressure stimulus outputs is any haptic action with a z directional or third directional sensation or literal motion to create notice. In each case the haptic generator or pressure stimulus include any duration and stimulus output delivery pattern. A vibration, oscillation, is defined in the physiological sense and definitional sense. An oscillation with a frequency so high that the cycle is not felt is not deemed and oscillation or vibration, but a pulse, a constant sensation, or even a warming. A low frequency oscillation is observed physiologically as an elongation, a rubbing, massage, and similar tactile sensation more common to the wearer than an high frequency oscillation. Similarly, if the user has to take a right turn, a similar procedure can be followed with respect to insole R. For convenience, the above description uses oscillations of 0-225 ms, 550-1000 ms, and a duration at a few meters, near the point of action, and at the point of the turn, respectively. It should be understood that in practice, oscillations of any pattern and/or duration can be used to convey feedback to a user. The frequency and duration of the signal can be determined by the user such that it is noticeable under their situational or physiological conditions. Haptic sensation can be notice based on frequency, duration, amplitude, direction, and pattern, and their combinations. It is included in the device that a stimulus output may be vibratory and non-vibratory, but more of a motion stimulus output focusing more on amplitude than frequency, or any combination of frequency, direction, amplitude, duration, and pattern, and their combinations and multiplicity on one or more haptic signals. Other forms of haptic stimulus output include a two or three dimensional notification. A user can have the option to personalize the operation of system A including without limitation the oscillation patterns, intensity, and/or duration. In this manner, direction as well as distance information can be communicated to the user through oscillation feedback. In some embodiments, system A can also be configured to support multi-modal navigation including travel by a car, taxi, and/or public transport. For example, if a user of system A sets a destination that requires travel by public transport such as a bus, system A will for example, first navigate the user to the closest bus-stop by conveying directional information through a pattern of oscillations as discussed above. Once the user has reached the bus-stop, MU can be configured to inform the user (via audio) of the bus to be boarded and the expected arrival time of the bus. In some embodiments, insole L and/or insole R can be configured to give a oscillation pattern (identifiable by the user) to alert the user that controller may have an audio alert. Once the user is on the bus, the user can receive an indication through a pattern of oscillations in insole L and/or insole R, as to when to get down from the bus. Once the user is out of the bus, system A can continue to navigate the user to the set destination by conveying directional information through a pattern of oscillations as discussed above. In some embodiments, system A can be configured to create custom map pressure sensor of certain routes and/or add custom paths to the map data stored locally on controller. this feature can be used by users who have a favorite short-cut (bypass route) which is not mapped or for users who live in remote areas where smaller streets are not mapped. controller can be configured to interact with insole L and R to create a custom path. For example, during navigation, a user can interact with controller to add a short-cut or a bypass (such as a walk through a neighborhood park) that can reduce his or her travel time to a set destination. when the user is about to make a detour from the route calculated by controller, he or she can press (or speak) a button on controller to initiate the custom path creation procedure. controller can record location information (via location unit) along the path travelled by the user. In some embodiments, controller can be configured to periodically record one or more gpressure sensor coordinate (latitude and longitude) values and digital compass values along the custom path. when the user has completed the detour and is back on a mapped street, he or she can press (or speak) the same or a different button on controller. controller can then be configured to process the recorded location information along the custom path and controller can be further configured to update the users map data locally stored on controller to include the custom route. for a given short-cut, this process needs to be done only once. The next time the user sets a destination that can involve navigating in the same vicinity, the newly added shortcut can be automatically checked while computing a route.

In some embodiments, during navigation, if a user makes a detour to a location that is not included in the map data, he or she can be automatically queried by controller (using oscillations) if the detour should be added as a custom route. if the user agrees, the detour will be automatically added to the locally stored map data.

In some embodiments, a user can start and/or stop the custom path creation procedure without physically interacting with controller. as will be discussed in detail later, the
user can also start and/or stop the custom map/path creation procedure by controller by executing a foot based gesture through one or more of insole L and/or insole R.

[0170] In some embodiments, system A can be configured to provide orientation assistance to a user. That is, system A can assist a user to point (head/face) in a correct direction (north, south, east, west, etc.). The movement detector (included in insole L and R) can further include one or more of a 3-axis accelerometer, a gyroscope, and/or magnetometer (digital compass). Microprocessor control unit in both insole L and R can be configured to use corresponding magnetometer readings to compute the current heading of a user. In this way, if the intended or desired heading is known, the difference between the current heading and intended heading is calculated and a user can be pointed (oriented) in the right direction through a different pattern of oscillations. In some embodiments, the magnetometer can be configured to give a reading between 0 to 360 degrees with 0 degrees corresponding to magnetic North.

[0171] For example, during navigation, when a route to be taken by the user is computed, controller can also be configured to compute a desired heading at each turn/direction in the route from the map data. Therefore, when a user is ready to navigate, the first feedback he or she can receive can be indicative of orientation. For example, if the current heading of a user is in the “North” direction, and the calculated route requires the user to be headed in the east direction, the user can receive a oscillation pattern (such as, for example a continuous pulsed oscillation) on insole R. Upon receiving this pattern of oscillation, the user while standing in the same position can rotate towards his or her right. When the user is oriented in the correct direction (“East” in case of the example above), the oscillation stop pressure sensor. Thus, the user can be alerted that he or she is oriented in the right direction. In some embodiments, system A can be configured to check for orientation readings in real-time. That is, during navigation to a set destination, if a user is heading off-course, an orientation correction mechanism can be automatically triggered and the user’s orientation can be corrected by oscillation patterns in insole L and/or R, as discussed above.

[0172] In some embodiments, orientation assistance can also be helpful in known indoor as well as outdoor locations. For example, while navigating to/from or within known locations, the system may not require orientation information. In this case, the user can interact with controller and request to be oriented in a particular direction.

[0173] In some embodiments, a user can request for orientation correction and/or request to be pointed in a particular direction without interacting with controller. As will be discussed in detail later, the user can also request for orientation correction without interacting with controller by executing a foot based gesture through one or more of insole L and/or insole R. Furthermore, in some embodiments, the orientation procedures discussed above can be performed by any one of insole L or insole R.

[0174] In some embodiments, system A can be used to assist a user with indoor Navigation around locations such as, for example, homes, offices, malls, hospitals, etc. In manner similar to the custom map/path creation procedure discussed above, system A can also be configured to generate and save custom pressure sensor of indoor locations.

[0175] As was discussed above, insole L and R can each include one or more of an accelerometer, gyroscope and a magnetometer (digital compass) included as part of movement detector. When a custom map creation procedure is requested and/or executed by a user for indoor map creation, microprocessor control unit in each of insole L and R can be configured to process corresponding readings from one or more of the accelerometer, gyroscope, and digital compass. Microprocessor control unit in each of insole L and R can be further configured to transmit the process magnetometer, accelerometer, and/or gyroscope data to controller. As will be discussed below, controller can be configured to receive magnetometer, accelerometer, and/or gyroscope data from insoles L and R, and in turn generate an indoor map.

[0176] Every motion/gesture made by a user’s foot/feet (whether it’s taking a step forward or backward, or climbing up or down stairs, etc.) can have a specific pattern of accelerometer and/or the gyroscope readings. Insoles L and R can be configured to detect and identify various motions and/or gestures made by a user by processing the readings received from the accelerometer, magnetometer, and/or gyroscope. For example, in some embodiments, insoles L and R can use accelerometer reading (in movement detector) to detect step-pressure sensor made/taken by a person, and can use gyroscope readings to compute a distance covered by the user in each corresponding step. Furthermore, insoles R and L can use magnetometer readings to further get a direction of travel in each step. In this way, by computing the distance and direction travelled by a user, an indoor map can be created by system A for any location. As will be discussed in detail later, the user can also start and/or stop the custom map/path creation procedure by controller by executing a foot based gesture through one or more of insole L and/or insole R.

[0177] For an example, let us assume that a user of system A wishes to create an indoor map of a local hospital. For convenience, the discussion below explains the indoor map creation process with respect to a hospital. However, it should be understood that in practice the procedure below can be used to create a map for any indoor as well as outdoor location. To begin, the user can initiate the custom map creation procedure either by interacting with controller or by one or more foot based gestures. It should be understood that this procedure needs to be done only once and the map created is automatically updated to the map data stored locally on controller. Furthermore, when the custom map creation procedure is initiated, based on pressure sensor location information (from location unit included in controller), controller can automatically identify if the map to be created pertains to an indoor location and can automatically tag the map to the corresponding outdoor pressure sensor location.

[0178] For example a user can start the indoor custom map creation procedure at the entrance of the building. The user can enter a tag (such as “Entrance”) via text or voice in the Le Chal app. The user can then start walking to a desired destination with the building. Each turn made by the user (and detected by the magnetometer in insole L and/or R) can be marked as a node, and a distance between each node can be calculated based on the accelerometer and/or gyroscope readings from movement detector. In addition, all points of interest along a path can be tagged (such as “Entrance”, “Lobby”, “Doctor’s office”, etc.) by the user via text or voice in controller. Once the custom map creation procedure is complete, controller can be configured to implement an algorithm that can use graph theory and converts the various nodes and points of interest into a connected graph (indoor map). Furthermore, based on pressure sensor location information,
controller can be configured to automatically identify the indoor map as pertaining to an outdoor location and automatically tags the map to the corresponding outdoor pressure sensor location. Therefore, the next time the user intends to travel to the above mentioned indoor location, he or she can have the option to set any location (node) inside the hospital (for example his/her doctor’s office) as a destination. Furthermore, the above referenced indoor map creation procedure needs to be done only once and the map created is automatically updated to the map database stored locally on controller. In some embodiments, all the custom map data (indoor and/or outdoor) can be transmitted by controller (via a data connection) to a central server. The central server can then make the data received from each user available to all users of system A. Furthermore, in some embodiments, the indoor and/or outdoor custom map creation procedures can be performed by MU and any one of insole L or insole R.

In some embodiments, system A can be designed to be used as an interaction device. As was discussed earlier, movement detector can be used to detect various foot-based gestures. Furthermore, controller can be configured to enable a user to save various gestures and then assign each of the saved gestures to perform one or more actions. Once a particular gesture has been assigned, a user can interact with controller or insole L and/or R through gestures. It should be understood that there are no restrictions on the number of gestures that can be saved and/or assigned by system A.

As discussed above, in some embodiments, insole L and/or R can also be connected to one or more other external electronic devices such as TV’s, computers, laptop’s, game consoles, mobile phones, ipod, tablets, or any such device that can be configured to communicate with insoles L and/or R through a wired and/or wireless communication via corresponding RF units. In some embodiments, insole L and/or R can be discovered as a Bluetooth device and can be connected via Bluetooth to any Bluetooth enabled electronic device. In some embodiments, insole L and/or R can be a compatible electronic device via any radio frequency based communication protocol. Furthermore, in a manner similar to that discussed above a user wearing insole L and R can interact, communicate, and/or control any electronic device (connected to insoles L and R) through one or more gestures. Furthermore, all input and/or output feedback between insole L, insole R and the one or more connected electronic device (s) can be via haptics, such as, for example, one or more oscillations.

The device can include two insoles L (intended to be worn on the left foot) and R (intended to be worn on the right foot). Insoles L and R are similar in structure and functionality to insoles L and discussed.

The device can be embedded in a wearable object such as a apparel. The various units included in apparel can be embedded within the sole of apparel. For convenience, the following figures and discussion describe the various units of a apparel consistent with the disclosed embodiments as being embedded in the sole of the apparel. However, it should be understood that in practice the various units can be included in any part/area of the apparel. Therefore, the present disclosure is not limited in the location of the various units included in a apparel consistent with the disclosed embodiments. The various units/components included in apparel are similar in structure and functionality to the various units included in insole as discussed. Furthermore, the operation of apparel can be identical to the operation of insole, as discussed. For convenience, the apparel is depicted as including one actuation unit. However, it should be understood that in practice there may be any number of actuation units, such as exemplary vibrator, included in apparel. Therefore, the present disclosure is not limited in the number of actuation units that may be included and/or supported by a apparel consistent with the disclosed embodiments.

The device with Interaction System A consistent with the disclosed embodiments. The system A can include two apparel L (intended to be worn on the left foot) and R (intended to be worn on the right foot). The various units included in apparel L and R can be embedded within the sole of apparel L and R, respectively. The various units/components included in apparel L and R are similar in structure and functionality to the various units included in insoles L and R as discussed with respect to FIG. 4 c. Furthermore, the operation of apparel L and R can be identical to the operation of insole L and insole R, respectively, as discussed.

The device can include two apparel L (intended to be worn on the left foot) and R (intended to be worn on the right foot). The various units included in apparel L and R can be embedded within the sole of apparel L and R, respectively: The various units/components included in apparel L and R are similar in structure and functionality to the various units included in insoles L and R as discussed. Furthermore, the operation of apparel L and R can be identical to the operation of insole L and insole R, respectively, as discussed.

The device can be embedded in a wearable object such as a apparel, such as with each of the various units included in apparel can each be included inside a metal or plastic enclosure. The apparel can include an opening. Furthermore, opening can be designed in a manner such that enclosure can be securely fit into apparel. In addition, opening can also be designed in a manner that can allow a user to use apparel as a regular apparel (without the need of inserting enclosure). Furthermore, the operation of apparel can be identical to the operation of insole, as discussed. For convenience, it is depicted that apparel is including one actuation unit. However, it should be understood that in practice there may be any number of actuation units, such as exemplary vibrator, included in apparel. Therefore, the present disclosure is not limited in the number of actuation units that may be included and/or supported by a apparel consistent with the disclosed embodiments.

The device with Interaction System C consistent with the disclosed embodiments. The system C can include two apparel L (intended to be worn on the left foot) and R (intended to be worn on the right foot).

In some embodiments, the various units included in apparel L and R can each be included inside a metal or plastic enclosure. Each of apparel L and R can include an opening. Furthermore, opening can be designed in a manner such that enclosure can be securely fit into apparel L and R. In addition, opening can also be designed in a manner that can allow a user to use apparel L and R as a regular apparel (without the need of inserting enclosure). The apparel L and R as each including an opening on the side. However, it should be understood that in practice there may be any number of openings, such as exemplary opening that can included in any location in apparel L and/or R. Therefore, the present disclosure is not limited in the number or location of an opening that may be included and/or supported by a apparel consistent with the disclosed embodiments.
In some embodiments, enclosure can be designed in a manner that can protect the various units/components from impact due to the weight of a user or due to normal wear and tear. In this manner, a user can use any apparel that can include a compatible opening such as exemplary opening that can allow enclosure to be inserted into.

The various units/components included in apparel L and R are similar in structure and functionality to the various units included in insoles L and R as discussed. Furthermore, the operation of apparel L and R can be identical to the operation of insole L and insole R, respectively, as discussed.

The device with Interaction System D consistent with the disclosed embodiments. As shown the system D can include two apparel L (intended to be worn on the left foot) and R (intended to be worn on the right foot).

The various units included in apparel L and R can each be included inside a metal or plastic enclosure. Each of apparel L and R can include an opening. Opening and enclosure can be similar in structure and functionality to that discussed.

The various units/components included in apparel L and R are similar in structure and functionality to the various units included in insoles L and R as discussed. Furthermore, the operation of apparel L and R can be identical to the operation of insole L and insole R, respectively, as discussed.

The device with Interaction System E consistent with the disclosed embodiments. The system E can include two apparel L (intended to be worn on the left foot) and R (intended to be worn on the right foot).

The device with stimulus outputs or actuation units such as vibrator can be embedded in the sole of each of apparel L and R, respectively. The remaining units included in apparel L and R can each be included inside a metal or plastic enclosure. Each of apparel L and R can include an opening. Opening and enclosure can be similar in structure and functionality to that discussed.

The various units/components included in apparel L and R are similar in structure and functionality to the various units included in insoles L and R as discussed. Furthermore, the operation of apparel L and R can be identical to the operation of insole L and insole R, respectively, as discussed.

The device with Interaction System F consistent with the disclosed embodiments. The system F can include two apparel L (intended to be worn on the left foot) and R (intended to be worn on the right foot).

In some embodiments, the actuation unit such as vibrator can be embedded in the sole of each of apparel L and R, respectively. The remaining units included in apparel L and R can each be included inside a metal or plastic enclosure. Each of apparel L and R can include an opening. Opening and enclosure can be similar in structure and functionality to that discussed.

The various units/components included in apparel L and R are similar in structure and functionality to the various units included in insoles L and R as discussed. Furthermore, the operation of apparel L and R can be identical to the operation of insole L and insole R, respectively, as discussed.

The device can be embedded in a wearable object such as a apparel. The apparel can include a Microcontroller unit (microprocessor control unit) coupled to a power unit and a RF unit. Microprocessor control unit can be further coupled to an actuation unit such as a vibrational or movement detector or movement detector coupled to microprocessor control unit. In some embodiments, microprocessor control unit, power unit, RF unit, vibratory, and movement detector can have a similar structure and functionality as discussed.

For convenience, the apparel as including one actuation unit. However, it should be understood that in practice there may be any number of actuation units, such as exemplary vibratory unit included in apparel. Therefore, the present disclosure is not limited in the number of actuation units that may be included and/or supported by a apparel consistent with the disclosed embodiments.

The apparel can further include stimulus inputs of two ultrasonic sensors (Sonar) and coupled to microprocessor control unit. Sonar sensors and can be similar in structure and functionality as sensors and discussed. Furthermore, sensors and can have cones and, respectively. Microprocessor control unit can be further coupled to an image sensor such as camera (Cam). Cam can be similar in structure and functionality as image sensor discussed. In some embodiments, apparel can also include an illumination unit (ILU) that can be coupled to microprocessor control unit. Illumination unit can be similar in structure and functionality as illumination unit discussed. In some embodiments, apparel can also include a structured light projection unit (SLP) coupled to microprocessor control unit. SLP can be similar in structure and functionality as SLP discussed, and can project a light pattern.

Sonar sensors and, Cam, illumination unit, and SLP together with microprocessor control unit operate as an obstacle detection system and operate in a manner similar to that discussed. SLP can be similar in structure and functionality as SLP discussed.

The device with Interaction System A consistent with the disclosed embodiments. The system A can include two apparel L (intended to be worn on the left foot) and R (intended to be worn on the right foot). Apparel L and R are similar in structure and functionality to apparel discussed.

The apparel L and R can further communicate with a mobile unit such as exemplary controller. In some embodiments, controller can include computer readable program code which when executed by a processor in controller can configure controller to communicate with apparel L and R to provide functionality including but not limited to outdoor and indoor navigation, orientation, and interaction. The navigation, orientation, and interaction functionality provided by apparel L and R are similar to insoles L and R discussed.

In addition to the above mentioned functionality, in some embodiments, system A can also be configured to detect one or more obstacles of different types and sizes that can hinder the safe passage of a user. As was discussed above, system A can detect one or more obstacles in a manner similar to that discussed with respect to obstacle finding unit.

Once an obstacle is detected by apparel L and/or R, the user can be alerted about the presence of an obstacle through a pattern of oscillations (different from direction and/or orientation information). In some embodiments, apparel L and/or R can be configured to alert the user about the existence of an obstacle in two possible ways (modes). In a first mode (known as avoidance mode), if an obstacle is detected, apparel L and/or R can give the user a pattern of oscillations that can enable him or her to avoid the obstacle. For example, if an obstacle is detected directly in front of the user and another obstacle is detected to the right of the user, the user can receive a specific oscillation pattern on apparel L. The user identifies the oscillation pattern as being indicative of the presence of obstacle and rotates to his or her left till the
oscillation stopressure sensor (to indicate that the path is clear). In this manner, through oscillations a user can be navigated around obstacles.

[0207] In a second mode (known as perception mode), the user is alerted of the presence of an obstacle by varying the intensity of the oscillation patterns. This gives the user a perception of how far he or she is from an obstacle. For example, if an obstacle is detected to the left of the user, the user receives a oscillation on the apparel L wherein the intensity of the oscillation increases as the user gets closer to the detected obstacle and decreases as the user moves away from the obstacle. In this way, the user gets a perception of the obstacles around him or her and can decide on how to avoid the detected obstacles. The perception mode may be preferred by users if they are moving around in known environments.

[0208] In some embodiments, apparel L and R can be used by a user to provide obstacle detection functionality operate without the need of being connected to or communicating with controller.

[0209] The device with Interaction System B consistent with the disclosed embodiments, the system B can include two apparels L (intended to be worn on the left foot) and R (intended to be worn on the right foot). Apparels L and R are similar in structure and functionality to apparel discussed. Furthermore, the navigation, orientation, and interaction functionality provided by apparels L and R of system B are similar to insoles L and R discussed.

[0210] In addition to the above mentioned functionality, in some embodiments, system B can also be configured to detect one or more obstacles of different types and sizes that can hinder the safe passage of a user. In some embodiments, system B can be configured to detect one or more obstacles in a manner similar to that discussed with respect to obstacle finding unit.

[0211] Once an obstacle is detected by apparel L and/or R, the user can be alerted about the presence of an obstacle through a pattern of oscillations (different from direction and/or orientation information) and in a manner similar to that discussed. Furthermore, in some embodiments, apparels L and R can be used by a user to provide obstacle detection functionality operate without the need of being connected to or communicating with controller.

[0212] The device with Interaction System C consistent with the disclosed embodiments. The system C can include two apparels L (intended to be worn on the left foot) and R (intended to be worn on the right foot). Apparels L and R are similar in structure and functionality to apparel discussed. Furthermore, the navigation, orientation, and interaction functionality provided by apparels L and R of system C are similar to insoles L and R discussed.

[0213] In addition to the above mentioned functionality, in some embodiments, system C can also be configured to detect one or more obstacles of different types and sizes that can hinder the safe passage of a user. In some embodiments, system C can be configured to detect one or more obstacles in a manner similar to that discussed with respect to obstacle finding unit.

[0214] Once an obstacle is detected by apparel L and/or R, the user can be alerted about the presence of an obstacle through a pattern of oscillations (different from direction and/or orientation information) and in a manner similar to that discussed. Furthermore, in some embodiments, apparels L and R can be used by a user to provide obstacle detection functionality operate without the need of being connected to or communicating with controller.

[0215] The device with Interaction System D consistent with the disclosed embodiments. The system D can include two apparels L (intended to be worn on the left foot) and R (intended to be worn on the right foot). Apparels L and R are similar in structure and functionality to apparel discussed. Furthermore, the navigation, orientation, and interaction functionality provided by apparels L and R of system C are similar to insoles L and R discussed.

[0216] In addition to the above mentioned functionality, in some embodiments, system D can also be configured to detect one or more obstacles of different types and sizes that can hinder the safe passage of a user. In some embodiments, system D can be configured to detect one or more obstacles in a manner similar to that discussed with respect to obstacle finding unit.

[0217] Once an obstacle is detected by apparel L and/or R, the user can be alerted about the presence of an obstacle through a pattern of oscillations (different from direction and/or orientation information) and in a manner similar to that discussed. Furthermore, in some embodiments, apparels L and R can be used by a user to provide obstacle detection functionality operate without the need of being connected to or communicating with controller.

[0218] The device with Interaction System E consistent with the disclosed embodiments. The system E can include two apparels L (intended to be worn on the left foot) and R (intended to be worn on the right foot). Apparels L and R are similar in structure and functionality to apparel discussed. Furthermore, the navigation, orientation, and interaction functionality provided by apparels L and R of system E are similar to insoles L and R discussed.

[0219] In addition to the above mentioned functionality, in some embodiments, system E can also be configured to detect one or more obstacles of different types and sizes that can hinder the safe passage of a user. In some embodiments, system E can be configured to detect one or more obstacles in a manner similar to that discussed with respect to obstacle finding unit.

[0220] Once an obstacle is detected by apparel L and/or R, the user can be alerted about the presence of an obstacle through a pattern of oscillations (different from direction and/or orientation information) and in a manner similar to that discussed. Furthermore, in some embodiments, apparels L and R can be used by a user to provide obstacle detection functionality operate without the need of being connected to or communicating with controller.

[0221] As was discussed earlier, a user can personalize several functions, operations, and/or gestures. Other embodiments will be apparent to those skilled in the art based on the disclosed embodiments. Various modifications may be made to the systems or methods in the disclosed embodiments. The specification and examples are exemplary only, with, a true scope and spirit of the disclosure being indicated by the following claims.

[0222] In summary, today’s digital age, there have been several advancements in the field of Human Computer Interaction. However, using the feet, foot, and to include other tactile sensitive areas such as ankle, wrist, waist, neck, ears, and other areas of the body create what is called “body sensing” based haptic interaction devices as a medium for human computer interaction remains relatively unexplored. In some situations, body sensing based haptic interaction devices can
be very beneficial for individuals with a physical disability. For example, if a user suffers from visual impairment, performing daily activities such as, for example, navigation, orientation, and/or obstacle detection independently can become challenging. Currently available navigation systems for the visually challenged rely primarily on providing audio feedback. Because visually challenged individuals rely heavily on their sense of hearing, pure audio feedback can be a distraction. Furthermore, conventional, navigation and interaction systems for visually challenged individuals are complex to use, obtrusive (bulky) and are also a burden to carry by the visually impaired people.

[0223] With respect to able bodied individuals, current interactive systems operate by relying primarily on Audio, visual, and hand based feedback. However, there exist several situations wherein relying on and/or providing feedback via the aforementioned senses may be distracting and non-intuitive. Therefore, there is a need for a more efficient foot based haptic interaction system that is intuitive to use and non-obtrusive.

Passive and Dynamic Indicator and Manipulator Teaching and Aiding Devices

[0224] FIG. 8 are perspective views of passive shape snap fasteners for teaching and aiding interactive apparel and are formed to affix to standard apparel and using one or more fasteners in one or more locations on the apparel. The Indicator and Manipulator is attached to require specific matching of the opposing fastener member creating teaching and aiding of proper apparel assembly and wearing, based on apparel function, fashion, performance improvement, or their combination.

[0225] Indicators and Manipulators include design and structure of the full range of mechanical, chemical, electrical, electronic, acoustic, thermal, material properties (material state, shape memory, shape change with a form of impetus, non-magnetic to magnetic, non-adhesion to adhesion, non-conductive to conductive, and all other), color, texture, solid, woven, or other properties used by Indicators or Manipulators singularly or any combination. Manipulators include features that prohibit, limit, or make difficult the improper use of apparel. Only by way of example and not an exhaustive list, includes snaps with unique design that only allow exact matching for proper closure or proper appendage use. Manipulators include but are not limited to shapes specific closures, buttons and holes of different sizing, zippers of different length or teeth size, snaps, clasp hooks, clasp screws, buckles, loops, buttons, loops and rods, catches, rings, toggles, clips, clips, hinged wires, thread posts, clutch backs, tension backs, spring rings, open boxes, bayonets, magnets, screws, bars, and more.

[0226] A square snap fastener 810a Indicator and Manipulator with a square projection to only be received by the matching triangle snap receptacle 810b of the pair, each with holes for apparel attachment. The use of square snap projection 810a is placed at any location on apparel to force alignment and registry with respect to the fastener. Only square snap receptacle 810b will match and force proper alignment and create proper apparel function and fashion. With Manipulator snap projection 810c and Manipulator snap receptacle 810b snapped in place, then other Manipulator pairs or more traditional apparel closure can follow to complete proper apparel function and fashion.

[0227] A circular snap fastener 812a Indicator and Manipulator with a circular projection to only be received by the matching circular snap receptacle 812b of the pair, each with holes for apparel attachment. Manipulators can be located on opposing articles of apparel to compel proper association of apparel. A sleeve may have attached Manipulator circular snap fastener 812a with projection and a glove having Manipulator circular snap receptacle 812b forcing this particular sleeve and glove combination. Another pair of gloves could also have Manipulator circular snap receptacle 812b and allow multiple apparel association. The opposite sleeve may have no Manipulator or may have attached for function or fashion circular snap receptacle 812b and in this case the glove would have attached Manipulator snap projection 812a. This disclosure also includes the use of Manipulators 600a and 600b on one sleeve and glove combination and 812a and 812b on another sleeve and glove combination.

[0228] A pentagon snap fastener 814a Indicator and Manipulator with a pentagon projection to only be received by the matching pentagon snap receptacle 814b of the pair, each with holes for apparel attachment.

[0229] A cross snap fastener 816a Indicator and Manipulator with a cross projection to only be received by the matching cross snap receptacle 816b of the pair, each with holes for apparel attachment.

[0230] A triangle snap fastener 818a Indicator and Manipulator with a square projection to only be received by the matching triangle snap receptacle 818b of the pair, each with holes for apparel attachment.

[0231] A hexagon snap fastener 820a Indicator and Manipulator with a hexagon projection to only be received by the matching hexagonal snap receptacle 820b of the pair, each with holes for apparel attachment.

[0232] Only by way of example, the snap Manipulator fasteners are represented with holes for attachment to apparel. Other forms of attachment would equivalently enable the disclosure by using pressure sensitive tape, heat sensitive adhesives, epoxies, cellulose fibers or threads, polymer fibers or threads, and other forms of attachment or their combinations.

[0233] Only by way of example, the snap Manipulators illustrated are representative of numerous closures, attachments, and accessories available to be used as Indicators, Manipulators, or a combination of Manipulators and Indicators. Persons of ordinary skill in the art may appreciate that numerous design configurations may be possible to produce the functional benefits of the inventive systems of interactive appear for teaching and aiding proper apparel function, fashion, or combination of function and fashion.

[0234] The Manipulators illustrated include Indicator features used to create notice, guide, and seek to compel proper apparel use. Manipulators achieve the utility of teaching and aiding at the moment of most readiness to observe, register, and internalize learning. Manipulators can go beyond teaching and aiding for proper initial and ongoing use of apparel that is on or near the wearer.

[0235] FIG. 9 are perspective views of passive fasteners for teaching and aiding interactive apparel formed to affix to standard apparel and using one or more fasteners in one or more locations on the apparel to compel proper apparel use. Manipulators require specific matching of the opposing fastener member creating teaching and aiding of proper apparel assembly and wearing, based on apparel function, fashion,
improved performance or their combination. Two examples follow for illustration without intending to be limiting to these examples.

**[0236]** A magnetic circular disc Manipulator 910a can be used as a fastener when associated with another magnetic disc Manipulator 910b of opposite polarity. The function of indication is provided by the observation of an indetifiable difference among fasteners teaching and aiding in finding the like indicator on the apparel or associated apparel. The Manipulator or compelling function is that only the to magnets or magnet and magnet responsive material will fasten.

The second disc may be a magnetic responsive material. By way of example, without restriction to other forms of attachment each disc shown also has holes 912 for apparel attachment, but the disclosure would be equivalently enabled by using pressure sensitive tape, heat sensitive adhesives, epoxies, cellulosic fibers or threads, polymer fibers or threads, and other forms of attachment or their combinations.

**[0237]** A hook 920a and loop 920b button of fabric, polymeric, metallic, ceramic and other flexible material, or other materials, and their combinations is illustrated. The function of indication is provided by the observation of an indetifiable difference among fasteners teaching and aiding in finding the like indicator on the apparel or associated apparel. The Manipulator function is that a hook button 920a is not effective with another hook button 920a or that there is no other hook button 920a, but a similarly appearing and effective association with loop button 920b. By way of example, without restriction to other forms of attachment each disc shown also has stitching 922 for apparel attachment, but the disclosure would be equivalently enabled by using pressure sensitive tape, heat sensitive adhesives, epoxies, cellulosic fibers or threads, polymer fibers or threads, and other forms of attachment or their combinations.

**[0238]** The properties of the illustrated Manipulators are provided only by way of example and are not intended to restrict how apparel use can be guided and even compelled into proper use, function, and fashion or a combination. By way of example and not as a restrictive list, the magnetism of 910 may be created by electrical coils and an energy source. Further disclosure has already been made that one or more or a combination of Indicators and Manipulators may be used with apparel or between articles of apparel to achieve specific and proper apparel use, function, and fashion by teaching and aiding.

**[0239]** Fig. 10 is a block diagram of static Manipulators with apparel illustrating a method of teaching and aiding by static Manipulators to create interactive apparel. Represented are two forms of apparel achieving proper apparel association through the teaching and aiding of a static Manipulator of gloves and a jacket.

**[0240]** A use of apparel Manipulators for teaching and aiding in the proper apparel function and fashion. Starting with apparel having one element of a pair of static Manipulators 1010, and the apparel item being a glove 1010. For proper association of the glove, the matching Manipulator 1020 is attached to a jacket sleeve 1022. With the Jacket on and the glove placed on a hand and attachment attempted to indicate proper wear 1040. The wearer is taught and aiding with the questions if the static Manipulators of the sleeve and glove match 1050. If the glove and sleeve Manipulators do not conform and match, then it is intuitive with a threshold of cognitive awareness, to try the other glove of the pair to affirm the correct static Manipulator 1052. The cycle of teaching and aiding by 1040, 1050, and 1052 can continue until the glove with the proper Manipulator is found and worn. With the glove being worn with the matching Manipulator, the other glove can be attached. The second glove may have no Manipulator attached as an Indicator itself, or may contain a second Manipulator. The second sleeve and glove combination will be tested by the 1040, 1050, and 1052 cycle and with confirmation of the proper glove, then complete attachment of both gloves 1054 is accomplished with proper function and fashion of jacket and glove by teaching and aiding of static Manipulators.

**[0241]** To complete the jacket and glove combination, the jacket needs to be closed for proper function, fashion, or a combination of both. Another Manipulator, different from the glove, is used 1030. The two matching pieces of the Manipulator are separated and attached to each side of the jacket 1032. With the jacket on and closure attempted 1034 the wearer is taught and aided if the closure is correct by discovering if the static Manipulators of the left and right side closure match 1060. If the closures do not match then the wearer will move up or down one apparel closure to find the correct static Manipulator 1062. The cycle of 1060 and 1062 will continue until the matching Manipulators are associated. With the static Manipulator on the left and right side closure matching 1060 then complete jacket closure with original closures or other static Manipulators 1064 can be completed. Ultimately the static Manipulators created an interactive apparel where the wearer is in apparel being properly worn by teaching and aiding 1070.

**[0242]** The flow chart discussed illustrates an example of the use of static Indicators, Manipulators, or a combination of Indicators and Manipulators. For persons having ordinary skill in the art it is obvious that the placement of Indicators and Manipulators can vary, that the apparel with which they are affixed can vary widely, among many other function, fashion, performance improvers, and their combination and remain within the scope of the disclosure.

**[0243]** Fig. 11 are top views of readable information labels for teaching and aiding interactive apparel created to withstand the lifecycles of apparel and provide apparel specific and associated information that provides teaching and aiding in the proper function, fashion, performance improvement or combination use. Indicators are both simple cues to information rich communicators.

**[0244]** Indicators and Manipulators are either static and unchanging or dynamic. Static indicators and manipulators do not change in physical properties or message, but use their original form to suggest, direct, and with manipulators, compel. Dynamic Indicators and Dynamic Manipulators change in at least one property of the indicator, such as deliver a Stimulus Output, change information storage, change shape, change color, light up, or other physical changes and messaging changes. Indicators are used solely to create notice by wearer senses (audio, visual, haptic, physiologic, and their combinations), guide, and suggest proper apparel function, fashion, or their combination. Indicators do not prohibit the improper use of apparel, but indicate proper or improper use. Only by way of example, and not limited to the following, static Indicators include colors, textures, sizing, match fitting, and other visual, audio, haptic, or physiological communicators to the wearer. Only by way of example, and not limited to the following, dynamic Indicators include tags with barcode tags, quick response code tags, mini cards with magnetic tape tags, data fobs, microchips with RFID, and other information...
carrying and sharing devices that allow information communicated to improve function and fashion guidance.

The dynamic Indicators paired with a Interfacer each have a unique pattern that universally, or locally within the confines of the wearer's activity, be ascribed specific meaning and information content. Dynamic Indicators labels are imaged by a label recognition device associated with information that is universal about the apparel or wear specific and relevant information. Labels may be static without any change in physical, electronic, messaging or other properties by way of example, but not considered a limited list. Labels are inclusive of a dynamic labeling to include changes in physical, electronic, and message properties, for example, and not intended to be a limited list of change examples. Encodeable medium is another name for a label and is descriptive of any recordable, storage, and readable medium form that creates interactive apparel and only by way of example and not limited to the following, includes, labels, tags, films, cards, foils, pellets, rods, or any other medium and carrier. The encoding or association of information can occur before or after attachment with the apparel and can be changed and updated at any time. Upon use of the apparel, the wearer may scan the dynamic Indicator label and be informed, advised, given instruction, provided affirmation, or provided other sounds, words, phrases, or other messaging by audio, visual, haptic, physiological, computer display, portable device display, or other messaging, and their combinations. Dynamic Indicators have the advantage of communicating any universal or locally pre-communicated or pre-input information. Only by way of example, and not limited to this list such information can include apparel type, size, function, purpose, color, pattern, texture, cut, styling, weather properties, place of purchase or origination, suggestions of compatible apparel for function, fashion, or their combinations. Dynamic Indicators can also be used singly or in any grouping or combination. The wearer may scan a primary article of apparel and then scan for appropriate function, fashion, or their combination with a function or fashion compatible apparel based upon the comparison of message information between two or more dynamic Indicators. As mentioned encouragement towards association of apparel or discouragement against association can be made by established encoding associated with dynamic Indicator or as separate comparative or other informational processing.

An integral part of the dynamic Indicator is the Interfacer. The general construction and function of the Interfacer is readily known to persons having ordinary skill in the art. The specific dynamic Indicator Interfacer includes additional functionality as previously disclosed to include associating noise, sounds, words, phrases, and other messaging by audio, visual, haptic, physiologic, computer display, portable device display, brail display, or other messaging. The Interfacer is a device that recognizes the dynamic Indicator, interfaces with the wearer or other sources to receive information input, associates the dynamic Indicator signature with the input information is capable of recognizing the dynamic Indicator signature or unique information, delivers to the wearer the pre-assigned information about the article of apparel. Further, the Interfacer is capable of making an information database and artificial intelligence to derive correlations and judgments and provide messaging about apparel combinations for function, fashion, or their combination. The dynamic Indicator in combination with the Interfacer becomes an information based teaching and aiding platform for interactive apparel to guide proper apparel function, fashion, or their combinations.

Matrix code label 1110a and 1110b is a device optically recognizable two dimensional barcode label with four standardized encoding modes of numeric, alphanumeric, byte and binary, and kanji to associate information to the unique image and extract the same information. The matrix barcode provides greater message capacity than other barcodes. The matrix code consists of high contrast patterns between the backing and the modules or square dots. Apparel applications are ideally created on fabric providing sufficient module contrast for information association as well as being most compatible with apparel, wearer comfort and appeal, and apparel maintenance and care. By way of example, and not limited to the following the matrix barcode is also available as a dynamic Indicator from woven fabric, nonwoven fabric, polymer film, metal sheet, and other two dimensional forming materials of natural appearance or that can be coated to form a surface for sufficient contrast with needed modules. The matrix code is affixed to the apparel by methods known to persons having ordinary skill in the art and include by way of example, but not limited to stitching, pressure sensitive adhesive, heat sensitive adhesives, epoxies, cellulose fibers or threads, polymers fibers or threads, as well as single or multiple point attachment, small pocket or enclosure, other forms of attachment, and their combinations. The matrix code stores and releases a cache of information specific to an article of apparel or combination of articles to ensure proper apparel function and fashion.

Line code label 1120 is a device optically recognizable two dimensional line code label that consists of 12 numerical digits, which are uniquely assigned. Although more limited in its message capacity, the line code is applicable to dynamic Indicators and apparel messaging. The line code label follows information association, construction, use, attachment, and other attributes associated with the matrix code previously discussed.

Magnetic label is not shown, but is based upon its own material integrity or as a film applied to a substrate to provide a recognizable, encodeable, and readable medium. The magnetic label follows, information association, construction, use, attachment, and other attributes associated with the matrix code previously discussed.

Microchip label is not shown, but is adaptable to applications of apparel teaching and aiding for proper apparel use. The microchip is of micro-electronic construction and is a passive device without a power source. Within its construction is an antenna for of passive radio frequency construction for encoding the device, exchanging information, as well as powering the unit. The disclosure is the adaptation and use for creating interactive apparel for teaching and aiding in apparel function and fashion, but the microchip with passive radio frequency construction is known by persons of ordinary skill in the art. The microchip label follows information association, construction, use, attachment, and other attributes associated with the matrix code previously discussed.

Persons of ordinary skill in the art may appreciate that numerous configurations of the disclosures may be possible to produce the functional benefits of the inventive systems. The representations made of dynamic Indicators is considered illustrative only, of the principles of the disclosure. Further since numerous modifications and changes will readily occur to persons having ordinary skill in the art, dis-
closures are not intended to be limited in any way to their exact construction and operation. All suitable modification and equivalents may be resorted to falling within the scope of the disclosure.

[0252] FIG. 12 is a block diagram of dynamic Indicators with apparel for creating teaching and aiding interactive apparel. Represented are two forms of apparel achieving proper association by the teaching and aiding of a dynamic Manipulator of gloves and a jacket.

[0253] A use of apparel dynamic Indicators for teaching and aiding in the proper apparel function, fashion, and their combinations. Starting with the apparel is a jacket 1212 prepared as apparel with a dynamic Indicator attached 1210. An Interfacer of the dynamic Indicator identifies the unique pattern signature associated with the Indicator 1214. The Interfacer is prepared to accept unique identifying information about the article of apparel (color, cloth type, texture, design, cut, etc.) by input mode and the Interfacer then associates the apparel specific input information to the unique pattern signature of the dynamic Indicator 1216. The jacket with the dynamic Indicator is now identified by the dynamic Indicator 1218 and for example it could be a jacket that is cotton, black, and with blue trim 1220.

[0254] Also selecting for this example is another article of apparel or a scarf 1232 prepared as apparel with a dynamic Indicator attached 1230. An Interfacer of the dynamic Indicator identifies the unique pattern signature associated with the Indicator 1234. The interface is prepared to accept unique identifying information about the article of apparel or scarf (color, cloth type, texture, design, etc.) by input mode and the Interfacer then associates the apparel specific input information to the unique pattern signature of the dynamic Indicator 1236. The scarf with the dynamic Indicator is now identified by the dynamic Indicator 1238 and for example it could be a scarf with blue and yellow paisley 1240.

[0255] Apparel for wear is selected and the Interfacer is used to read the apparel’s dynamic Indicator and communicates initial information to the human senses (audio, visual, haptic, physiological, or their combinations) 1222. Another article of apparel is selected for wearing and the Interfacer is used to read the apparel’s dynamic Indicator and communicated initial information to the human sense senses (audio, visual, haptic, physiological, or their combinations) 1242. The Interfacer then compares the information retrieved from the dynamic interface and provides an indication of a suitable match or an unsuitable match 1250. The Interfacer then communicates to the wearer’s senses by audio, visual, haptic, physiological, or their combination the degree of match and the degree of necessity that a new selection is needed 1260. A new selection is made and read by the Interfacer 1242, a comparison is made between the information on the dynamic Indicator and a degree of match is determined 1250. This cycle continues until a suitable match is obtained 1270. As an Indicator, the wearer is not compelled to follow the messaging of the Interfacer.

[0256] The flow chart discussed illustrates an example of the use of dynamic Indicators. For persons having ordinary skill in the art it is obvious that the placement of Indicators can vary, that the apparel with which they are affixed can vary widely, among many other function, fashion, and combination of function and fashion considerations and remain within the scope of the disclosure. The flow diagram of the dynamic Indicator in combination with the Interfacer display the utility of interactive apparel for wearers throughout our society of all levels of ability to achieve proper apparel use, function, fashion, or a combination.

[0257] Although not a formal set of claims, the above disclosure is captured succinctly in the following. Apparel comprising: one or more devices for teaching and aiding apparel use; and said devices being single or multiple capable. Said device comprising: one or more stimulus inputs for detecting condition of apparel use; and one or more stimulus outputs for teaching and aiding of apparel use. Said device comprising: one or more stimulus inputs and stimulus outputs are in separate devices; and one or more stimulus inputs and stimulus outputs are fully or partially combined devices. Said stimulus inputs and stimulus outputs comprising: electronic circuitry, transmitters, emitters, receivers, detectors, input interfaces, output interfaces and said indicators, and associated components; assembled for receiving one or more stimulus inputs; and assembled for delivering one or more stimulus outputs. Apparel comprising: one or more said separate devices or combined devices integrated into said apparel. Apparel comprising: one or more said separate devices or combined devices external and detachable and attachable to said apparel. Apparel comprising: one or a combination of devices. A device comprising: one or more said stimulus inputs a said stimulus inputs responds to a single, multiple, changing, continuous, variable, or other input, or combination of inputs; and the said input being any form from human interaction to a particle, wave, radiation, gradient, pressure, chemical, electrical, electronic, thermal, change of state, or any other. A device comprising: a one or more said stimulus outputs creating an indicator; said indicator is any output recognized by unaided or aided human visual, audio, or haptic senses; said indicator is any combination of audio, visual, or haptic communicators; and said indicator that communicates to the senses that apparel condition of use is correct or that use is not correct, or a combination of both correct and not correct indication in any relationship. A said stimulus input comprising: stimulus separate from the apparel. A said stimulus output comprising: stimulus output communication separate from the apparel. A stimulus comprising: no require previous apparel use knowledge. A stimulus comprising: no secondary action for apparel use for initial teaching and aiding. Apparel comprising: footwear with said one or more devices; and teaching and aiding that the left footwear is correctly placed on the left foot and the right footwear on the right foot, or that placement is not correct, or a combination of both correct and not correct indication in any relationship. Apparel comprising: one or more manipulators for proper apparel use; said manipulator indicates proper apparel use and guides proper apparel use; said manipulators may be permanent affixed to apparel; said manipulators may be semi-permanently affixed to apparel; and said manipulators may be temporarily associated for removal and reassociation to apparel. Said manipulator comprising: static manipulators that do not change in properties or message; one or more said static manipulators may be used with one apparel item to train and aid use of the specific apparel item; and one or more said static manipulators may be used between apparel to train and aid use between one or more apparel items. Said manipulator comprising: dynamic manipulators that change in properties or message; one or more said dynamic manipulators may be used with one apparel item to train and aid use of the specific apparel item; and one or more said dynamic manipulators may be used between apparel to train and aid use between one or more apparel items.
apparel item; and one or more said dynamic manipulators may be used between apparel to train and aid use between one or more apparel items. Said dynamic manipulator comprising: properties are encoded and stored locally or in network resources for later communication; messages are customizable by associated devices; detected by any dynamic manipulator reader; and communication of the message may be apparel specific or a message relevant to the combination of apparel used for the purpose of teaching and aiding in apparel use. Said dynamic manipulators comprising: encodable medium; said encodable medium can be associated with different apparel properties; and said encodable medium can be associated with different human audio, visual, or haptic senses.

[0258] Persons of ordinary skill in the art may appreciate that numerous configurations and modifications can evolve from the disclosures to produce the functional benefits of the inventive systems of interactive apparel for teaching and aiding without departing from the spirit the invention of interactive apparel for teaching and aiding as a whole. Thus the disclosure made are considered illustrative current best modes, yet only illustrative of the principles of the disclosures, and not intended to be limited in any way to their exact construction and operation. All suitable modification and equivalents may be resorted to falling within the scope of the disclosure. The wide variety of configurations and arrangements of spirit and scope of the disclosures is reflected by the breadth of the claims below rather than narrowed by the disclosures described above.

1. Apparel comprising:
one or more devices for teaching and aiding apparel use; and
said devices configured and used singly or in multiples.
2. Said device in claim 1 comprising:
one or more stimulus inputs for detecting condition of apparel use; and
one or more stimulus outputs for teaching and aiding of apparel use.
3. Said device in claim 2 comprising:
one or more stimulus inputs and stimulus outputs are in separate devices; and
one or more stimulus inputs and stimulus outputs are fully or partially combined devices.
4. Said stimulus inputs and stimulus outputs in claim 2 comprising:
electronic circuitry, transmitters, emitters, receivers, detectors, input interfaces, output interfaces and said indicators, and associated components; assembled for receiving one or more stimulus inputs; and assembled for delivering one or more stimulus outputs.
5. Apparel comprising:
one or more said separate devices or combined devices in claim 4 integrated into said apparel.
6. Apparel comprising:
one or more said separate devices or combined devices in claim 4 removable and insertable with said apparel.
7. Apparel comprising:
one or more said separate devices or combined devices in claim 4 external and detachable and reattachable to said apparel.
8. Apparel comprising:
one or a combination of devices in claim 5, 6, or 7.

9. A device in claim 2 comprising:
one or more said stimulus inputs a said stimulus inputs responds to a single, multiple, changing, continuous, variable, or other input, or combination of inputs; and
the said input being any form from human interaction to a particle, wave, radiation, gradient, pressure, chemical, electrical, electronic, thermal, change of state, or any other.

10. A device in claim 2 comprising:
a one or more said stimulus outputs creating an Indicator, said Indicator is any output recognized by unaided or aided human audio, visual, or haptic senses; said Indicator is any combination of audio, visual, or haptic communicators; and
said Indicator that communicates to the senses that apparel condition of use is correct or that use is not correct, or a combination of both correct and not correct indication in any relationship.

11. A said stimulus input of claim 9 comprising:
stimulus separate from the apparel.
12. A said stimulus output of claim 10 comprising:
stimulus output communication separate from the apparel.
13. A stimulus of claim 9 or 10 comprising:
no require previous apparel use knowledge.
14. A stimulus of claim 9 or 10 comprising:
no secondary action for apparel use for initial teaching and aiding.
15. Apparel of claim 1 comprising:
footwear with said one or more devices; and
teaching and aiding that the left footwear is correctly placed on the left foot and the right footwear on the right foot, or that placement is not correct, or a combination of both correct and not correct indication in any relationship.
16. Apparel comprising:
one or more Manipulators for proper apparel use;
said Manipulator indicates proper apparel use and guides proper apparel use;
said Manipulators may be permanent affixed to apparel;
said Manipulators may be semi-permanently affixed to apparel; and
said Manipulators may be temporarily associated for removal and reassociation to apparel.
17. Said Manipulator of claim 16 comprising:
static Manipulators that do not change in properties or message;
one or more said static Manipulators may be used with one apparel item to train and aid use of the specific apparel item; and
one or more said static Manipulators may be used between apparel to train and aid use between one or more apparel items.
18. Said Manipulator of claim 16 comprising:
dynamic Manipulators that change in properties or message;
one or more said dynamic Manipulators may be used with one apparel item to train and aid use of the specific apparel item; and
one or more said dynamic Manipulators may be used between apparel to train and aid use between one or more apparel items.
19. Said dynamic Manipulator of claim 18 comprising:
properties are encoded and stored locally or in network resources for later communication;
messages are customizable by associated devices;
detected by any dynamic Manipulator reader; and
communication of the message may be apparel specific or
a message relevant to the combination of apparel each
for the purpose of teaching and aiding in apparel use.
20. Said dynamic Manipulators of claim 19 comprising:
encodeable medium;
said encodeable medium can be associated with different
apparel properties; and
said encodeable medium can be associated with different
human audio, visual, or haptic senses.
21. A haptic feedback based footwear attachable apparel
device, the footwear device comprising:
at least one microprocessor unit, the at least one micropro-
cessor unit configured to control at least one operation of
the footwear;
at least one battery, the at least one battery configured to
provide a power supply voltage;
at least one Radio Frequency (RF) unit, the at least one RF
unit configured to communicate with at least one exter-
nal electronic device using at least one wireless commu-
nication protocol;
at least one haptic oscillator generator, the at least one
haptic oscillator configured to generate at least one pat-
tern of oscillation; and
at least one inertial motion unit (IMU), the at least one IMU
further including at least one magnetometer, the at least
one magnetometer configured to provide at least one
reading indicative of orientation.
22. A haptic feedback based attachable apparel device, the
device comprising:
at least one microprocessor unit, the at least one micropro-
cessor unit configured to control at least one operation of
the device;
at least one battery, the at least one battery configured to
provide a power supply voltage;
at least one Radio Frequency (RF) unit, the at least one RF
unit configured to communicate with at least one exter-
nal electronic device using at least one wireless commu-
nication protocol;
at least one haptic oscillator generator, the at least one
haptic oscillator configured to generate at least one pat-
tern of oscillation; and
at least one inertial motion unit (IMU), the at least one IMU
further including at least one magnetometer, the at least
one magnetometer configured to provide at least one
reading indicative of orientation.

* * * * *