(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 947 588 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
15.04.2020 Bulletin 2020/16

(51) Int Cl.:
G16H 20/30 *(2018.01)* ***A61B 5/11*** *(2006.01)*
A61B 5/00 *(2006.01)*

(21) Application number: **15168189.7**

(22) Date of filing: **19.05.2015**

(54) **METHOD FOR CALCULATING THE ACTIVITY OF A USER**

VERFAHREN ZUR BERECHNUNG DER AKTIVITÄT EINES NUTZERS

PROCÉDÉ DE CALCUL DE L'ACTIVITÉ D'UN UTILISATEUR

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **20.05.2014 FR 1454498**

(43) Date of publication of application:
25.11.2015 Bulletin 2015/48

(73) Proprietor: **Withings**
92130 Issy-les-Moulineaux (FR)

(72) Inventors:
- **Saadi, Rachid**
  78370 Plaisir (FR)
- **Buard, Nadine**
  92190 Meudon (FR)
- **Hutchings, Cédric**
  92130 Issy Les Moulineaux (FR)

(74) Representative: **Plasseraud IP**
66, rue de la Chaussée d'Antin
75440 Paris Cedex 09 (FR)

(56) References cited:
WO-A1-2013/109762 US-A1- 2013 196 688
US-B1- 7 057 551

EP 2 947 588 B1

Description

[0001] The present invention relates to methods for calculating the activity of a user, particularly methods for determining the type of activity performed by the user and the associated caloric expenditure.

[0002] More particularly, the invention relates to a method for calculating the activity of a user by using a combination of a personal activity monitor and a smartphone (or equivalent) equipped with a geolocation function. For an individual referred to as a "user", the term "activity" as used here covers walking, running, walking a dog, bicycling, golf, horseback riding, ball sports, racket sports, as well as riding a scooter, a skateboard, or any non-motorized travel or even motorized travel.

[0003] A personal activity monitor is a small and very lightweight device that the user can carry close to the body, for example at the wrist or at the belt, or in any suitable location where said monitor can be securely associated with the body of the user.

[0004] There are known activity monitors which measure the activity of a user, such as those disclosed in US2013 0325404, particularly those having an embedded accelerometer. This type of activity monitor can thus detect the steps of the user (if the user is running, this is called the 'stride') and therefore count the steps and/or strides of a user when he or she is moving about on foot and/or walking and/or running. This type of activity monitor also tracks the corresponding distance covered by the user, calorie expenditure, and ascents/descents.

[0005] Although the estimation of the number of steps is relatively accurate, the evaluation of the distance traveled can be problematic and imprecise because the distance traveled is obtained by multiplying the number of steps (or strides) by a predefined average step value. Statistical surveys show that the average step (stride) of individuals can vary from 0.6m to 2.5m which represents a wide range. Even if the predefined step value can be estimated based on user height (assuming that the user can enter this into the activity monitor), calculation of the distance traveled remains inaccurate, especially when the user is performing a variety of activities (strolling, brisk walking, light jogging, sustained jogging, fast running) and given the natural diversity among individuals. Double integration of acceleration signals would also be affected by imprecision.

[0006] The estimation of ascents/descents or calorie expenditure is also affected by imprecision.

[0007] Some have proposed to include a GPS receiver in this type of activity monitor, but this raises two important issues: firstly, a GPS receiver is a heavy power consumer and this greatly reduces the autonomy of the activity monitor, and secondly, integration of such a GPS receiver results in an increase in the dimensions and weight of the activity monitor.

[0008] There is therefore a need to improve the reliability of the 'distance traveled' information evaluated and displayed by such personal activity monitors.

[0009] To this end, the invention provides a method for calculating the activity of a user, said method being implemented by a portable electronic first device (1) consisting of a personal activity monitor intended to be securely associated with the body of the user and capable of detecting the accelerations experienced, and by a portable electronic second device (2) consisting of a smartphone equipped with a geolocation function, the first and second devices being physically independent and being configured to exchange data over a wireless connection, the first device having in a memory (47) different average step values (MKO-U) according to the different types of activity, for the user to which the first device is associated, and the method comprising the steps of:

-a- the first device measuring the signals of accelerations experienced and counting substantially continuously the steps or cycles of the user,

-b- the second device determining the current geolocation of the user at a first time (T1), which constitutes the first geolocation (A1),

-c- the second device determining the current geolocation of the user at a second time (T2), which constitutes the second geolocation (A2),

-d- one of the two devices (1,2) calculating a first distance traveled (D12) between the first and second geolocations (A1, A2),

-e1- deducing, based on the levels of acceleration experienced between the first and second times (T1, T2) and on the first distance traveled D12, the current type of activity among a plurality of types of activity including walking, running, bicycling, horseback riding, racket sports, and golf,

-e2- deducing a calculation of the calorie expenditure between the first and second times,

-e3- if the current type of activity is walking, running, or bicycling, the first device (1) calculating based on said first distance traveled D12 and the number of steps taken between the first and second geolocations (A1, A2), the average stride and/or average step and/or average gear ratio of the user between the first and second geolocations, such that the first device is updating an average step value (MKO-Ui) according to the corresponding type of activity.

[0010] With these arrangements, the first device can personalize and refine its own data concerning that particular user about the type of activity performed and the average stride and/or average step and/or average gear ratio of that particular user.

[0011] Further, the first device can carry on assessing the traveled distance in a reliable fashion, even though the geolocation is temporarily not available, for example in the following cases : Smartphone (second device) shut-off, Smartphone forgotten at home, underground gymnastics premises with poor GPS satellites signals availability.

[0012] In preferred embodiments of the invention, it is possible that one or more of the following arrangements may also be used.

[0013] In steps **-b-** and **-c-**, preferably the second device determines the current geolocation of the user in response to a request from the first device; determination of the geolocation is thus initiated by the first device, such that use of the GPS tracking resource can occur according to the intensity and level of user activity, which allows contacting the GPS resource in the most optimized way, and in particular eliminating such contact if the activity monitor is stationary and thus minimizing power consumption on the smartphone side.

[0014] The first device may send geolocation queries to the second device based on one or more of the following predetermined criteria: in particular at the beginning or end of activity, and/or in case of a change of activity intensity level, and/or after a predefined number of steps since the last query, and/or after a predefined length of time since the last query. The activity monitor thus continuously adapts the frequency of queries towards the GPS resource, minimizing power consumption by both the electrical activity monitor and the smartphone.

[0015] In step -d-, it is preferably the second device 2 that calculates the first distance traveled D12 and that sends this to the first device 1, the latter performing steps -e1-, -e2-, and -e3-; the distance calculation operations, requiring non-trivial operations, are thus performed by the smartphone and not by the activity monitor.

[0016] In step **-d-**, the first distance traveled D12 is calculated as a geometric distance between the first and second geolocations (A1, A2). The second device thus performs a simple calculation of the distance as the crow flies between the geographic coordinates of two geolocations.

[0017] In addition, the geolocation function of the second device 2 may have access to a mapping database, and the second device 2 calculates, by means of the access to the mapping database, the actual distance traveled by the user along the map route between the first and second geolocations A1, A2. This is an accurate calculation using the most likely path followed by the user (whether pedestrian or cyclist).

[0018] The method may further comprise, between steps -b- and **-c-**, a step of determining one or more intermediate geolocations between the first and second geolocations, the distance calculation then summing the distances between successive geolocations. One can thus limit the amount of data exchanged between the first device and the second device, the first device merely requesting from the second device the total distance traveled, for example at the end of the activity in question.

[0019] The geolocation function of the second device may be provided by a GPS receiver. Geolocations can thus be determined in a highly accurate manner.

[0020] The geolocation function of the second device 2 may be provided by the determination of antenna signals from antennas of known location, particularly the antennas of cellular telephone networks, antennas of Wifi hotspots, or the equivalent. It is thus possible to obtain the geolocation even without a GPS receiver or to supplement the GPS receiver when the receiver is not receiving satellite signals.

[0021] The antenna signals can be complemented in the second device by the use of a magnetometer or gyroscope. This enables more accurate estimation of the position when satellite signals are not available or there is no GPS receiver.

[0022] According to an alternative solution, after each geolocation determination, the second device 2 sends the geographic coordinates determined in steps -b- and -c-(meaning the first and second geolocations) to the first device, said first device can then perform steps **-d-**, **-e1-**, **-e2-**, and **-e3-**; the smartphone can thus provide the geolocation information to the first device (the activity monitor) by a very simple method, which will allow the first device itself to apply corrections to the average stride of the user.

[0023] The second device can send to the first device, spontaneously at regular intervals (Ti), the geographic coordinates of the user's current geolocation; thus, the geographic coordinates are regularly available to the first device and said first device can calculate the distance traveled in each interval between successive positions, and deduce a correction for the average stride of the user in a simple manner. This provides a very simple method that can function without maps, and that uses a simple routine of a smartphone application.

[0024] In another alternative, steps **-d-**, **-e1-**, **-e2-**, and **-e3-**are performed by the second device, the first device thus not performing any complicated calculations and directly receiving the corrections to be applied to the average stride of the user concerned; the first device can then remain very simple in its functionalities, very light, and very small, with low power draw.

[0025] A database may be provided that relates a plurality of geolocation data and a type of user activity, in order to improve the determination of the average stride of the user. This provides additional clarification on the assumed activity, and the value of the average stride can be adapted to the type of activity: strolling, walking, jogging, running, racket sports, ball sports, horseback riding, golf, bowling, mushroom picking, hiking with ascents and/or descents, etc.

[0026] According to another object of the invention, an information system is provided for a user, comprising a portable electronic first device (1) consisting of a personal activity monitor (1) intended to be securely associated with the body of the user, having a weight less than 50 grams and without its own means of geolocation, and a portable electronic second device (2) consisting of a smartphone (2) equipped with a geolocation function, the first and second devices being physically independent (distinct) and configured to exchange data over a wireless connection, the first device having in a memory (47) different average step values (MKO-U) according to the different types of activity, for the user to which the first device is associated, and

- the first device being configured to measure the signals of acceleration experienced and to count almost continuously the user steps or cycles,
- the second device being configured to determine the current geolocation of the user at a first time (T1), which constitutes the first geolocation (A1),
- the second device being configured to determine the current geolocation of the user at a second time (T2), which constitutes the second geolocation (A2),
- the second device being configured to calculate a first distance traveled between the first and second geolocations A1, A2,
- the first device being configured to calculate, using said first distance traveled D12 and the number of steps taken between the first and second geolocations (A1, A2), the average stride and/or average step (MKO-Ui) and/or average gear ratio of the user between the first and second geolocations, whereby the first device is configured to refine the average step and stride value or values for that particular user.

[0027] Other features and advantages of the invention will become apparent from the following description of several of its embodiments, given by way of non-limiting example and with reference to the accompanying drawings.

[0028] In the drawings:

- figure 1 shows a user equipped with an activity monitor and smartphone,
- figure 2 shows the information evaluated and displayed by the activity monitor of figure 1,
- figure 3 shows a functional block diagram of the activity monitor and smartphone,
- figure 4 shows a timing diagram of the exchanges between the activity monitor and smartphone,
- figure 5 shows a variant of the timing diagram of figure 4,
- figure 6 shows another variant of the timing diagram of figure 4,
- figure 7 shows a route followed by a user.
- figure 8 shows a variant of the route of figure 7,
- figure 9 shows an alternate route followed by a user,
- figure 10 shows curves that illustrate how multiple activity monitors gradually adjust respectively the average step/stride values for individual users.

[0029] In the various figures, the same references designate identical or similar elements.

[0030] In figure 1, a user **U** is equipped with a first portable electronic device **1** and a second portable electronic device **2**, which are able to communicate with each other.

Activity Monitor

[0031] The first electronic device **1** may be in the form of an activity monitor, adapted to be securely associated with the body of the user, for example at the wrist. It can thus continuously detect and count the user's activity, by means of an accelerometer inside the housing of this activity monitor. Another term used for this kind of device is "activity tracker."

[0032] Specifically, in the example shown, the first portable electronic device 1 is in the form of an activity monitor, for example the "Pulse"™ product from Withings™, the Applicant. The activity monitor may be in the form of a small housing, with a display system that shows the activity. The activity monitor is able to provide information to the user about his or her physical activity, walking, running, sleeping, stair climbing, etc.

[0033] Figure 2 shows some of the information that the first device can provide to the user U, for example the distance traveled, the number of steps, elevation climbed, and number of calories burned.

[0034] The activity monitor **1** shown here weighs less than 10 grams, preferably less than 8 grams, even more preferably less than 6 grams. Its dimensions are particularly small, the thickness being at most equal to 8 mm, the width at most equal to 43 mm, and the height at most equal to 22 mm.

[0035] According to one solution, the first electronic device **1** may be in the form of some other device incorporating an activity monitor, such as a wristwatch named « Activité™» or « Activité Pop ™» from the Applicant Withings™, and in this case, the first device weighs less than 50 grams, preferably less than 40 grams.

[0036] Alternatively, the first electronic device **1** may be in the form of instrumented eyeglasses, or smart glasses such as "Google Glass"™. It should be noted that the first device may also be integrated into another device on the user, such as in an earbud, hearing aid, smart necklace, digital identification tag inserted under the skin, etc.

[0037] In general, the first electronic device **1** is adapted to be substantially secured to at least a portion of the body of said user during said method, for example worn on the belt of the user, or on a bracelet attached to the wrist; analysis of the signals provided by the accelerometer allows measuring the acceleration signals, evaluating the intensity of the signals and their more or less periodic aspects, and accurately detecting the steps made by the user **U**, and strides even more so.

[0038] In general, the amplitude, temporal, and frequency characteristics of the acceleration signals allow recognizing the type of activity performed by the user, namely whether the user is walking, running, bicycling, horseback riding, playing golf, etc. Determining the type of activity allows more precise calculation of calorie expenditure.

[0039] The activity monitor **1** is preferably deprived of a GPS receiver.

Smartphone

[0040] The portable electronic second device **2** consists here of a smartphone. Said portable electronic second device **2** may be located, for example, in a handbag carried by the user as shown in figure 1, or in a pocket, backpack, or elsewhere, therefore not necessarily worn close to the body.

[0041] The second device **2** could also be in the form of a tablet, phablet, nettop, or PDA, accompanying the user **U.**

[0042] The second device **2** has larger dimensions than those of the first device, generally has a screen measuring several inches diagonally, and generally comprises a plurality of functionalities, including basic routines (in the operating system) and high-level applications. In the context of the invention, the functionalities of interest concern the geolocation capabilities available in the second device 2.

[0043] According to one embodiment, the geolocation function is provided by a GPS receiver configured to receive and decode signals from GPS positioning satellites (known per se). Of course, "GPS" is also understood to refer to equivalent systems such as GLONASS and Galileo.

[0044] Additionally or alternatively, the second device 2 may rely on analysis of signals from terrestrial antennas of known geolocation. More specifically, the geographic location of all wireless relays is listed in a database, and the geographic location of all cell antenna towers of all cellular telephone networks is also listed in a database. By analyzing the identification of the antennas from which signals are received by the second device, using triangulation in favorable cases and/or evaluating the strength of the received signals, the geolocation of the second device can be determined relatively accurately without directly receiving GPS satellite signals.

[0045] According to an additional function, the analysis of GPS signals and/or the analysis of terrestrial antenna signals can also be complemented by the use of a magnetometer or gyroscope; these devices provide information about relative displacement, particularly the direction, which is useful in case the other signals mentioned above are not always available or have momentary interruptions or are of degraded quality.

[0046] Note that in the context of the invention, the smartphone 2, the user U, and the activity monitor 1 are considered to be very close to each other, and the differences between the geographic locations of the three entities can be neglected.

Communication and Figure 3

[0047] Both devices (1,2) are able to connect to one another and exchange data, preferably over a wireless connection. The wireless connection can be established by a Bluetooth™, WiFi, Zigbee, RFID, or equivalent interface.

[0048] The smartphone 2 is further provided with the ability to communicate with a cellular telephone network (optionally with Internet access), which optionally provides it with access to one or more databases of mapping data (geo-maps) which will be discussed further below.

[0049] As illustrated in figure 3, said first device 1 comprises a computation unit **14**, a Bluetooth™ communication interface **42**, a display **3**, and a multi-axis acceleration sensor **7.** The acceleration sensor **7** can detect accelerations experienced by the device, from which are estimated the accelerations experienced by the user. The acceleration information is used to estimate the number of steps taken by the user.

[0050] The display **3** is configured to provide the user with a plurality of information, particularly the number of steps taken and distance traveled in a counter. This counter may reset daily or at some other period depending on the configuration specified by the user. The display may be a touch display, which allows the user **U** to scroll through different types of information.

[0051] The computation unit **14** processes the data via a processor which comprises memory **47** and which manages in said memory the data directly measured by the first device 1 or for example received from another device such as the smartphone 2. The first device 1 also stores in said memory 47 the different average step values for the user in possession of said device, and according to the different types of activity.

[0052] The computation unit 14 is powered by an embedded power source **8**, for example a rechargeable battery as shown here, which supplies power to all the embedded elements.

[0053] As is also illustrated in figure 3, said second device **2** also comprises a computation unit **140.**

[0054] The smartphone 2 may advantageously comprise a GPS receiver **10** connected to the computation unit **140**, from which the user's position at any moment can be precisely calculated.

[0055] Additionally, the second device 2 may comprise a magnetometer **61**, a gyroscope **62**, or even a mini gyroroscope platform.

[0056] The smartphone **2** comprises an operating system, known per se, for example such as Android™ or iOS™; this operating system may include standard services (basic routines available for all applications), in this case a geolocation service. This geolocation service makes use of the aforementioned available resources, GPS receiver, identification of terrestrial antennas of known geographical location, magnetometer, gyroroscope, etc.

[0057] The smartphone **2** may comprise a number of applications that can be launched by the user or that run continuously in the background, some of them using the geolocation service.

[0058] The first device **1** may contact the geolocation service of the operating system of the second device 2 directly, or it may contact a higher level application that uses the geolocation service and mapping elements.

[0059] The computation unit **140** comprises a display **30** configured to provide the user with a plurality of information as is known, a Bluetooth™ communication interface **420**, and a memory **470** where a plurality of data are stored and managed.

[0060] The second device 2 also comprises another communication antenna **64** for a cellular telephone network and yet another communication antenna 65 for a WLAN or WiFi type of local area network.

[0061] The computation unit **140** is powered by an embedded power source 80, in the current case for example a rechargeable battery that powers all embedded elements.

Average step correction - Figures 4-8

[0062] In the embodiments described below, the first device 1 measures accelerations, and continuously detects and counts the user's steps (step **-a-** of the method). In addition, it stores in memory at least one predetermined value for the average step of the user during walking conditions; advantageously, the first device can store several predefined values **MKO-U** in memory (see fig. 10 and associated comments below), for the average step for each of the identified user activities (strolling, fast walking, slow jogging, running, sprinting, hiking uphill and downhill, etc).

[0063] Note that the invention can also be applied in an activity other than running or walking, for example bicycling, horseback riding, racket sports, ball sports, etc. In the case of bicycling, the first device 1 continuously detects and counts the pedal strokes of the user.

[0064] Advantageously according to the invention, the first device will attempt to further customize these predefined values as will be described in detail below.

[0065] According to a first embodiment, in the example shown in figure 4, it is the first device 1 that initiates the exchange between the first device 1 and the second device 2. In the example shown, the user's route includes a walking phase **PH1**, a running phase **PH2**, and a resting phase **PH3** (not moving).

[0066] The first device successively sends geolocation requests at times **T1**, **T2**, ..., **Tn** to the second device 2.

[0067] At each request, the second device 2 determines the geolocation of the current position, which means the successive geolocations **A1**, **A2**, ..., **An**. The geolocation determination operation at points A1 and A2 corresponds to steps -b- and -c- of the method.

[0068] In addition, after each geolocation determination operation, the second device **2** calculates the distance traveled since the geolocation previously determined, this calculation operation (step **-d-**) being represented by the triangle 25 and detailed further below.

[0069] For example, at time **T2**, the second device **2** calculates the distance between points **A1** and **A2**, denoted **'DistA1-A2',** and also called the 'first distance traveled' and denoted **D12,** and sends this distance D12 to the first device.

[0070] The first device **1** can then calculate (step -e3-) the specific average step **M12** of the user which corresponds to the ratio D12/N12, **N12** being the number of steps detected and counted between the query at time **T1** and the query at time **T2.** The use by the activity monitor of the value of the specific average step M12 will be detailed further below.

[0071] The above operations can, of course, be repeated recursively.

[0072] The first device **1** may also use this opportunity to update the total distance by adding the distance received D12 to the known total.

[0073] A special case concerns certain types of activities that are practiced within a relatively small area, such as racket sports, ball sports, or show jumping, and in this case the distance calculations give very low results because the user often moves back and forth over small distances; this is put to good use by determining that it is indeed a type of activity restricted to a specific field. The size of the field allows clarifying the type of activity, such as squash, badminton, tennis, handball, basketball, football, rugby, or golf. In the case of golf, the signal that is characteristic of a swing is also used to determine this specific type of activity.

[0074] In the case of practicing jogging on a treadmill in a gym room, the recognition of the activity type is important to avoid false calculations of an average stride close to 0 knowing that the GPS location does not vary much when the user U runs on the treadmill.

[0075] In the case of the bicycle, it is not the average step that the system calculates but the gear ratio, meaning the distance traveled per pedal stroke. The pedaling speed is also used along with the gear ratio to correct the calculation of calorie expenditure.

[0076] Note that geographic coordinates can also include an elevation coordinate, and in this case the distance between points **A1** and **A2** also includes the elevation gain or loss. The first device 1 can use this to consolidate the information into the net elevation gain, and to refine the calculation of calorie consumption.

[0077] The operations described above are repeated at time **T3** for the portion of the path between points **A2** and **A3**, then again repeated between points **A3** and **A4** at time **T4**, and so on.

[0078] The first device **1** may issue requests on a regular basis. Advantageously, the first device will issue queries on the basis of one or more of the following predetermined criteria:

- at the beginning or end of the activity,
- and/or in case of a change in the level of activity,

- and/or after N1 steps since the last query,
- and/or after X1 minutes since the last query
- according to the detected level of activity, the frequency being proportional to the intensity of the detected activity.

[0079] In figure 4, one can see that the querying frequency is higher in period **PH2** where the user U is running, while it is slower in the period **PH1** where the user is walking, and there are no more queries during the resting phase **PH3**.

[0080] For the criterion concerning the number of steps N1 that will trigger a new query, one can take parameter **N1** within a range of 50 to 200 steps, typically choosing N1=100 steps.

[0081] Similarly, for the criterion concerning the time since the last query, one can take parameter **X1** within a range of 30s to 180s, for example 60s, 90s, or 120s.

[0082] One will note that the activity monitor can submit additional geolocation queries, for example with each change of activity level or type, as is illustrated at times T4 and T8 in figure 4.

[0083] For calculating the distance traveled (step **-d-** of the method), according to a **first** solution the second device 2 calculates the distance traveled A1-A2 between two times T1-T2, geometrically, by extrapolating between two geolocations along a straight line (distance as the crow flies) . The second device 2 sends this information to the first device 1 which calculates, using the number of steps between positions A1 and A2, the average stride of the user between the two positions concerned. This solution is quite acceptable if most of the path segments between points Ai and Ai+1 are substantially straight, which is usually true in urban conditions.

[0084] According to a **second** solution for calculating the distance traveled, the second device 2 is provided with a mapping function, preferably used in this case by setting the mode to 'walking'. By calculating the map route, the second device 2 determines which feasible path was followed by the user between the two geolocations Ai and Ai+1. The actual distance traveled by the user between the two geolocations can thus be calculated precisely, and in some cases this result may be quite different from a straight line, as illustrated in figure 9.

[0085] Note that the mapping calculation function can be performed locally on the smartphone or by a remote Web service called upon by the smartphone.

[0086] Using a mapping calculation of the distance allows longer times between queries from the activity monitor (larger **X1** and/or **N1**), thereby reducing power consumption for this function and also reducing the amount of data exchanged.

[0087] In a variant of the first embodiment, shown in figure 5, the queries from the first device 1 do not systematically result in calculating and returning the distance traveled. The first device 1 may request the distance traveled from time to time, but not with every query. This variant may be advantageous in the case where the second device 2 does not have any mapping function nor access to a mapping resource, and in this case it will calculate the distances by line segments between the various intermediate points **A3a**, **A3b**, **A3c,** without calling upon a mapping resource. The sum of the segment distances then gives the distance between two moments **T1**,**A1** and **T2**,**A2** where the first device requests the distance traveled. The intermediate points **A3a**, **A3b**, **A3c** can be considered as waypoints that serve to calculate a distance traveled that accurately represents the actual route taken by the user U.

[0088] In this case there is therefore a simple query type **27** such as a 'track' position query, and a complete query type **28** for requesting the result of calculating the distance traveled.

[0089] Figure 7 shows a case where the geolocation determinations are infrequent and where the use of a mapping aid helps avoid errors in interpolation (solid line connecting the crosses); for the same path, figure 8 illustrates a case where the geolocation determinations are more frequent and the use of a mapping aid is not required, and in addition the total distance traveled can be updated in near real time from the data received from the smartphone.

[0090] In a second embodiment represented in figure 6, the first device **1** does not initiate the exchanges, it simply receives information regularly and spontaneously sent by the second device **2.**

[0091] Specifically, the user's current position is sent to the first device **1** by the second device **2.** The first device **1** thus calculates the distance traveled **A1-A2** between two times **T1**,**T2**, by extrapolating between two geolocations along a straight line, and repeats the operation for the path between points A2 and A3, then A3 and A4, and so on.

[0092] The first device **1** calculates, using the number of steps between positions A1 and A2, the average stride **M12** of the user between the two positions concerned. The activity monitor 1 may or may not use the information received from the smartphone depending on requirements, for example depending on the actual activity of the user U.

[0093] The logic for sending geolocation information from the smartphone **2** may be based on a predetermined time period (figure 6), or the interval between the transmission of geolocation data may depend on the actual displacement of the smartphone, for example whenever the smartphone has moved at least 10 meters.

[0094] According to yet another embodiment not shown in the figures, the functionality supported by the first device is simplified. In this case, as is known, the first device 1 regularly sends to the second device **2** the number of steps of the user for statistical purposes and for displaying to the user on the display **30.** This data 'upload' can be done with each new Bluetooth connection, or according to a certain schedule, for example every five minutes.

[0095] It should be noted that some of the data uploaded by the activity monitor to the smartphone are time-stamped, and advantageously the clocks of the activity monitor and smartphone are synchronized.

[0096] In the present case, the second device 2 not only calculates the distance traveled A1-A2 between two times T1, T2, but it also determines the specific average stride M12 of the user, this value M12 being obtained as above based on the distance traveled A1 and A2 between two times T1, T2 and on the number of steps N1 received from the activity tracker 1. This information on the specific average stride M12 is sent back to the first device 1 so it can refine the average step value of the user.

[0097] As a variant, the second device 2 comprises (or accesses) a pre-established database relating geolocation and type of user activity. When the geolocation of the user is determined by the second device 2, the database on physical activities in relation to geolocation is queried to determine the most likely activity. This parameter is included in order to make corrections to the average stride of the user. Geolocation data can thus indicate that the user U is walking along a conventional street, or along a path in a park, or on a mountain trail, or on the track of a stadium, etc.

[0098] Referring to figure 10, four types of activity are defined as an example: a leisurely stroll **AC10,** a brisk walk **AC20,** jogging **AC30,** and running **AC40.**

[0099] Also defined are three different users: **U1** and **U2** whose heights are not known to their respective activity monitors or have not been specified in the web interface, and a third user **U3** whose height is known to her activity monitor: 1.67m.

[0100] As indicated above, the average step/stride varies widely from one activity to another and from one individual to another. However, for the first activity AC10 of a leisurely stroll, one can assume that the statistical average step varies from 0.5m for a person 1.60m in height to 1m for a person 1.90m in height. Similarly, for the brisk walking activity **AC20** one can assume that the statistical average step varies from 0.8m for a person 1.60m in height to 1.4m for a person 1.90m in height. Similarly, for the jogging activity **AC30** one can assume that the statistical average stride varies from 1.2m for a person 1.60m in height to 1.9 m for a person 1.90m in height; for **AC40** (running), the statistical average stride varies from 1.7m for a person 1.60m in height to 2.5m for a person 1.90m in height.

[0101] In the absence of information on the user height, the activity monitor will take initial values corresponding for example to the statistical value of 1.75m, which gives the points M10-ini, M20-ini, M30-ini, and M40-ini indicated by small circles in figure 10.

[0102] In the case of user **U3**, the starting values can be more accurate, giving points **M10-iniU3,** M20-iniU3, M30-iniU3, and M40-iniU3, indicated by small squares in figure 10.

[0103] Subsequent usage of the activity monitor 1 by each user U1, U2, U3 allows refining these initial values so they are customized for the user concerned.

[0104] For each user (for example **U1**), each new calculation of the specific average step **M12** from the calculations described above is first classified into one of the types of activity (for example **AC10)** and then incorporated into the old known value **M10-U1** using a moving average digital filter. As a result, the average value **M10-U1** changes over time and becomes a specific value linked to the user **U1.**

[0105] For this user **U1**, four curves **M10-U1**, **M20-U1**, **M30-U1**, **M40-U1** are obtained which converge to the average personal step/stride values.

[0106] The same thing occurs for user **U2** who is carrying his own activity monitor, which although starting from the same initial values as for U1, evolves to other asymptotic values with curves **M10-U2**, **M20-U2**, **M30-U2**, **M40-U2.**

[0107] Personalized knowledge of parameters **MK0-Ui** for the step/stride values by type of activity allows the activity monitor to calculate the distance traveled in a reliable manner, even in the absence of a nearby smartphone; indeed, it should be noted that this system functions by learning and that after the learning phase for a personal activity monitor used by one user, the calculation of the distance traveled is reliable even when the user is only carrying his or her personal activity monitor (and not carrying a smartphone).

[0108] It should also be noted that the correction by geolocation is self-adaptive. For example, if an activity monitor is used by someone other than the usual person, then the average step/stride values will gradually be corrected to reach the values specific to the new user.

[0109] According to a more general aspect not necessarily related to a walking or running activity, after step -d- of determining the distance traveled, the proposed method implements step -e-, which can be defined in three steps:

-e1- based on the acceleration levels experienced between the first and second times (T1, T2) and on the first distance traveled D12, the **type of current activity** is deduced from among a plurality of types of activity comprising walking, running, bicycling, horseback riding, racket sports, and golf, this non-limiting list already having been mentioned above, the determination being done by either the personal activity monitor or the smartphone depending on the case, as indicated above,

-e2- from this, a calculation of the calorie expenditure between the first and second times is deduced, this calculation being done by either by the personal monitor activity or the smartphone depending on the case, as indicated above,

-e3- if the current type of activity is walking, running, or bicycling, the average step (if walking) and/or the average stride (if running) and/or the average gear ratio (if bicycling) is calculated.

[0110] Note that for the case of running laps within an enclosed stadium, the geolocation polling frequency may be increased in order to obtain at least two or more points along the circumference of the track.

[0111] For the particular case of horseback riding, the first device 1 can detect and recognize the characteristic amplitudes and frequencies of the acceleration signals involved when riding a horse. The impact of the four feet of the horse on the ground causes different frequency components than when a human is running or walking. The obtaining of the distance traveled, as explained above, by the second device 2 allows confirming the activity of horseback riding, particularly for the faster gaits of the horse (fast trot or gallop). Recognition of the "horseback riding" type of activity also allows a more accurate calculation of calories expended by the user, particularly according to the different gaits.

Claims

1. **Method** for calculating the activity of a user (U), said method being implemented by a portable electronic first device (1) consisting of a personal activity monitor (1) intended to be securely associated with the body of the user and capable of detecting the accelerations experienced, and by a portable electronic second device (2) consisting of a smartphone (2) equipped with a geolocation function, the first and second devices being physically independent and configured to exchange data over a wireless connection, the first device having in a memory (47) different average step values (MKO-U) according to the different types of activity, for the user to which the first device is associated, and the method comprising the steps of:

    -a- the first device measuring the signals of accelerations experienced and counting substantially continuously the steps or cycles performed by the user,
    -b- the second device determining the current geolocation of the user at a first time (T1), which constitutes the first geolocation (A1),
    -c- the second device determining the current geolocation of the user at a second time (T2), which constitutes the second geolocation (A2),
    -d- one of the two devices (1,2) calculating a first distance traveled, D12 between the first and second geolocations (A1,A2),
    -e1- deducing, based on the levels of acceleration experienced between the first and second times (T1,T2) and on the first distance traveled, D12, the current type of activity among a plurality of types of activity including walking, running, bicycling, horseback riding, racket sports, and golf,
    -e2- deducing a calculation of the calorie expenditure between the first and second times,
    -e3- if the current type of activity is walking, running, or bicycling, the first device (1) calculating, by means of said first distance traveled, D12, and the number of steps taken between the first and second geolocations (A1,A2), the average stride and/or average step and/or average gear ratio of the user between the first and second geolocations, such that the first device is updating an average step value (MKO-Ui) according to the corresponding type of activity, thereby personalizing its own data concerning that particular user.

2. Method according to claim 1, wherein, in steps **-b-** and **-c-**, the second device determines the current geolocation of the user in response to a request from the first device (1) .

3. Method according to claim 2, wherein the first device sends geolocation queries to the second device according to one or more of the following predetermined criteria: in particular at the beginning or end of an activity, and/or in case of a change in activity level, and/or after N1 steps since the last query, and/or after X1 minutes since the last query.

4. Method according to one of claims 1 to 3, wherein in step **-d-** it is the second device (2) that calculates the first distance traveled, D12, and sends this to the first device (1), the latter performing steps **-e1-**, **-e2-,** and **-e3-.**

5. Method according to claim 4, wherein in step **-d-,** the first distance traveled, D12, is calculated as a geometric distance between the first and second geolocations (A1, A2) .

6. Method according to claim 4, wherein the geolocation function of the second device (2) comprises access to a mapping database, and wherein the second device (2) calculates, by means of the access to the mapping database, the actual distance traveled by the user along the map route between the first and second geolocations A1, A2.

7. Method according to one of claims 1 to 6, wherein the method further comprises, between steps -b- and -c-, a step of determining one or more intermediate geolocations (A3) between the first and second geolocations, the distance calculation then summing the distances between successive intermediate geolocations.

8. Method according to any one of claims 1 to 7, wherein the geolocation function of the second device is provided by a GPS receiver.

9. Method according to any one of claims 1 to 7, where-

in the geolocation function of the second device (2) is provided by the determination of antenna signals from antennas of known location, particularly the antennas of cellular telephone networks, the antennas of Wifi hotspots, or the equivalent.

10. Method according to claim 9, wherein the antenna signals are complemented in the second device by the use of a magnetometer or gyroscope.

11. Method according to claim 1, wherein, after each geolocation determination, the second device (2) sends the geographic coordinates of the first and second geolocations to the first device, said first device then performing steps **-d-**, **-e1-**, **-e2-**, and **-e3.**

12. Method according to claim 11, wherein the second device (2) sends to the first device, spontaneously at regular intervals (Ti), the geographic coordinates of the user's current geolocation.

13. Method according to claim 1, wherein step **-d-** is performed by the second device.

14. Method according to any preceding claim, wherein a database is provided that relates a plurality of geolocation data and a type of user activity, in order to improve the determination of the average stride of the user.

15. Information system for a user, comprising a portable electronic first device (1) consisting of a personal activity monitor (1) intended to be securely associated with the body of the user, having a weight less than 50 grams and without its own means of geolocation, and a portable electronic second device (2) consisting of a smartphone (2) equipped with a geolocation function, the first and second devices being physically independent devices configured to exchange data over a wireless connection, the first device having in a memory (47) different average step values (MKO-U) according to the different types of activity, for the user to which the first device is associated

- the first device (1) being configured to measure the signals of accelerations experienced and to count substantially continuously the user steps or cycles,
- the second device being configured to determine the current geolocation of the user at a first time (T1), which constitutes the first geolocation (A1),
- the second device being configured to determine the current geolocation of the user at a second time (T2), which constitutes the second geolocation (A2),
- the second device being configured to calculate a first distance traveled between geolocations (A1, A2),
- the first device being configured to calculate, using said first distance traveled D12 and the number of steps taken between the first and second geolocations (A1, A2), the average stride and/or average step (MKO-Ui) and/or average gear ratio of the user between the first and second geolocations, whereby the first device is configured to refine the average step and stride values for that particular user.

Patentansprüche

1. Verfahren zur Berechnung der Aktivität eines Nutzers (U), wobei das Verfahren durchgeführt wird
von einer ersten tragbaren elektronischen Vorrichtung (1) bestehend aus einem persönlichen Aktivitätsmonitor (1), der sicher an dem Körper des Nutzers anzubringen ist und fähig zum Detektieren der erfahrenen Beschleunigungen ist, und
von einer zweiten tragbaren elektronischen Vorrichtung (2) bestehend aus einem mit einer Geolokationsfunktion ausgestatteten Smartphone (2),
wobei die erste und zweite Vorrichtung physikalisch voneinander unabhängig sind und konfiguriert sind, Daten über eine Drahtlosverbindung auszutauschen, wobei die erste Vorrichtung in einem Speicher (47) unterschiedliche durchschnittliche Schrittwerte (MKO-U) gemäß den unterschiedlichen Aktivitätstypen für den Nutzer hat, an dem die erste Vorrichtung angebracht ist, und das Verfahren die folgenden Schritte aufweist, in denen:

-a- die erste Vorrichtung die Signale der erfahrenen Beschleunigungen misst und die von dem Nutzer gemachten Schritte oder Zyklen im Wesentlichen kontinuierlich zählt,
-b- die zweite Vorrichtung die aktuelle Geolokation des Nutzers an einem ersten Zeitpunkt (T1) bestimmt, die die erste Geolokation (A1) darstellt;
-c- die zweite Vorrichtung die aktuelle Geolokation des Nutzers an einem zweiten Zeitpunkt (T2) bestimmt, die die zweite Geolokation (A2) darstellt;
-d- eine der zwei Vorrichtungen (1, 2) eine erste zurückgelegte Distanz, D12, zwischen der ersten und zweiten Geolokation (A1, A2) berechnet,
-e1- auf Basis der zwischen dem ersten und zweiten Zeitpunkt (T1, T2) erfahrenen Beschleunigungsmaße und der ersten zurückgelegten Distanz, D12, der aktuelle Aktivitätstyp aus mehreren Aktivitätstypen, darunter Gehen, Laufen, Radfahren, Reiten, Schlägersport und Golf, hergeleitet wird,

-e2- eine Berechnung des Kalorienverbrauchs zwischen dem ersten und zweiten Zeitpunkt hergeleitet wird,

-e3- falls der aktuelle Aktivitätstyp Gehen, Laufen oder Radfahren ist, die erste Vorrichtung (1) mit Hilfe der ersten zurückgelegten Distanz, D12, und der Anzahl von zwischen der ersten und zweiten Geolokation (A1, A2) gemachten Schritte die durchschnittliche Schrittlänge und/oder den durchschnittlichen Schritt und/oder das durchschnittliche Getriebeübersetzungsverhältnis des Nutzers zwischen der ersten und zweiten Geolokation berechnet, so dass die erste Vorrichtung einen durchschnittlichen Schrittwert (MKO-Ui) gemäß dem entsprechenden Aktivitätstyp aktualisiert, um dadurch ihre eigenen Daten, die den speziellen Nutzer betreffen, zu personalisieren.

2. Verfahren nach Anspruch 1, wobei in Schritt -b- und Schritt -c- die zweite Vorrichtung die aktuelle Geolokation des Nutzers als Antwort auf eine Anfrage aus der ersten Vorrichtung (1) bestimmt.

3. Verfahren nach Anspruch 2, wobei die erste Vorrichtung Geolokationsabfragen zu der zweiten Vorrichtung gemäß einem oder mehreren der folgenden vorgegebenen Kriterien sendet: insbesondere am Beginn oder am Ende einer Aktivität und/oder im Fall einer Änderung im Aktivitätsmaß und/oder nach N1 Schritten seit der letzten Abfrage und/oder nach X1 Minuten seit der letzten Abfrage.

4. Verfahren nach einem der Ansprüche 1 bis 3, wobei in Schritt -d- es die zweite Vorrichtung (2) ist, die die erste zurückgelegte Distanz, D12, berechnet und diese zu der ersten Vorrichtung (1) sendet, wobei die letztgenannte die Schritte -e1-, -e2- und -e3- durchführt.

5. Verfahren nach Anspruch 4, wobei in Schritt -d- die erste zurückgelegte Distanz, D12, als eine geometrische Distanz zwischen der ersten und der zweiten Geolokation (A1, A2) berechnet wird.

6. Verfahren nach Anspruch 4, wobei die Geolokationsfunktion der zweiten Vorrichtung (2) einen Zugang zu einer Kartendatenbank aufweist, und wobei die zweite Vorrichtung (2) mit Hilfe des Zugangs zu der Kartendatenbank die von dem Nutzer zurückgelegte aktuelle Distanz zwischen der ersten und der zweiten Geolokation A1, A2 entlang der Kartenroute berechnet.

7. Verfahren nach einem der Ansprüche 1 bis 6, wobei das Verfahren ferner zwischen Schritt -b- und Schritt -c- einen Schritt zum Bestimmen einer oder mehrerer Zwischengeolokationen (A3), die sich zwischen der ersten und der zweiten Geolokation befinden, aufweist, und die Distanzberechnung dann die Distanzen zwischen aufeinanderfolgenden Zwischengeolokationen aufsummiert.

8. Verfahren nach einem der Ansprüche 1 bis 7, wobei die Geolokationsfunktion der zweiten Vorrichtung von einem GPS-Empfänger bereitgestellt wird.

9. Verfahren nach einem der Ansprüche 1 bis 7, wobei die Geolokationsfunktion der zweiten Vorrichtung (2) von der Bestimmung von Antennensignalen aus Antennen bekannter Lokation bereitgestellt wird, insbesondere aus den Antennen von Mobilfunknetzen, den Antennen von WiFi-Hotspots oder dergleichen.

10. Verfahren nach Anspruch 9, wobei die Antennensignale in der zweiten Vorrichtung durch die Verwendung eines Magnetometers oder Gyroskops ergänzt werden.

11. Verfahren nach Anspruch 1, wobei nach jeder Geolokationsbestimmung die zweite Vorrichtung (2) die geographische Koordinaten der ersten und der zweiten Geolokation zu der ersten Vorrichtung sendet, wobei die erste Vorrichtung dann die Schritte -d-, -e1-, -e2- und -e3- durchführt.

12. Verfahren nach Anspruch 11, wobei die zweite Vorrichtung (2) die geographischen Koordinaten der aktuellen Geolokation des Nutzers spontan in regelmäßigen Intervallen (Ti) zu der ersten Vorrichtung sendet.

13. Verfahren nach Anspruch 1, wobei Schritt -d- von der zweiten Vorrichtung durchgeführt wird.

14. Verfahren nach einem der vorstehenden Ansprüche, wobei eine Datenbank bereitgestellt ist, die mehrere Geolokationsdaten und einen Nutzeraktivitätstyp in Beziehung setzt, um die Bestimmung der durchschnittlichen Schrittweite des Nutzers zu verbessern.

15. Informationssystem für einen Nutzer, aufweisend
eine erste tragbare elektronische Vorrichtung (1) bestehend aus einem persönlichen Aktivitätsmonitor (1), der sicher an dem Körper des Nutzers anzubringen ist, ein Gewicht von weniger als 50 Gramm und keine eigene Geolokationseinrichtungen hat, und
eine zweite tragbare elektronische Vorrichtung (2) bestehend aus einem mit einer Geolokationsfunktion ausgestatteten Smartphone (2),
wobei die erste und zweite Vorrichtung physikalisch voneinander unabhängige Vorrichtungen sind, die konfiguriert sind, Daten über eine Drahtlosverbindung auszutauschen, wobei die erste Vorrichtung in einem Speicher (47) unterschiedliche durchschnitt-

liche Schrittwerte (MKO-U) gemäß den unterschiedlichen Aktivitätstypen für den Nutzer hat, an dem die erste Vorrichtung angebracht ist,

- die erste Vorrichtung (1) konfiguriert ist, die Signale der erfahrenen Beschleunigungen zu messen und die Schritte oder Zyklen des Nutzers im Wesentlichen kontinuierlich zu zählen,
- die zweite Vorrichtung konfiguriert ist, die aktuelle Geolokation des Nutzers an einem ersten Zeitpunkt (T1) zu bestimmen, die die erste Geolokation (A1) darstellt;
- die zweite Vorrichtung konfiguriert ist, die aktuelle Geolokation des Nutzers an einem zweiten Zeitpunkt (T2) zu bestimmen, die die zweite Geolokation (A2) darstellt;
- die zweite Vorrichtung konfiguriert ist, eine erste zwischen Geolokationen (A1, A2) zurückgelegte Distanz zu berechnen,
- die erste Vorrichtung konfiguriert ist, unter Verwendung der ersten zurückgelegten Distanz, D12, und der Anzahl der zwischen der ersten und zweiten Geolokation (A1, A2) gemachten Schritte die durchschnittliche Schrittweite und/oder den durchschnittlichen Schritt (MKO-Ui) und/oder das durchschnittliche Getriebeübersetzungsverhältnis des Nutzers zwischen der ersten und zweiten Geolokation zu berechnen, wobei die erste Vorrichtung konfiguriert ist, die durchschnittlichen Schritt- und Schrittweitewerte für diesen speziellen Nutzer zu verfeinern.

Revendications

1. Procédé de calcul de l'activité d'un utilisateur (U), ledit procédé étant mis en œuvre par un premier dispositif (1) électronique portable constitué d'un moniteur d'activité personnel (1) destiné à être associé de manière sécurisée au corps de l'utilisateur et capable de détecter les accélérations subies, et par un second dispositif (2) électronique portable constitué d'un téléphone intelligent (2) constitué d'une fonction de géolocalisation, les premier et second dispositifs étant physiquement indépendants et configurés pour échanger des données sur une connexion sans fil, le premier dispositif comportant dans une mémoire (47) différentes valeurs de pas moyen (MKO-U) selon les différents types d'activité, pour l'utilisateur auquel le premier dispositif est associé, et le procédé comprenant les étapes de :

-a- le premier dispositif mesurant les signaux d'accélérations subies et comptant de manière substantiellement continue les pas ou les cycles effectués par l'utilisateur,
-b- le second dispositif déterminant la géolocalisation courante de l'utilisateur à un premier instant (T1), qui constitue la première géolocalisation (A1),
-c- le second dispositif déterminant la géolocalisation courante de l'utilisateur à un second instant (T2), qui constitue la seconde géolocalisation (A2),
-d- l'un des deux dispositifs (1, 2) calculant une première distance parcourue, D12, entre les première et seconde géolocalisations (A1, A2),
-e1- déduction, sur la base des niveaux d'accélération subis entre les premier et second instants (T1, T2) et de la première distance parcourue, D12, le type courant d'activité parmi une pluralité de types d'activité incluant la marche, la course, le cyclisme, l'équitation, les sports de raquette et le golf,
-e2- déduction d'un calcul de la dépense calorique entre les premier et second instants,
-e3- si le type courant d'activité est la marche, la course ou le cyclisme, le premier dispositif (1) calculant, au moyen de ladite première distance parcourue, D12, et du nombre de pas effectués entre les première et seconde géolocalisations (A1, A2), la foulée moyenne et/ou le pas moyen et/ou le braquet moyen de l'utilisateur entre les première et seconde géolocalisations, de telle manière que le premier dispositif met à jour une valeur de pas moyen (MKO-Ui) selon le type d'activité correspondant, personnalisant ainsi ses propres données concernant cet utilisateur particulier.

2. Procédé selon la revendication 1, dans lequel, dans les étapes -b- et -c-, le second dispositif détermine la géolocalisation courante de l'utilisateur en réponse à une requête en provenance du premier dispositif (1).

3. Procédé selon la revendication 2, dans lequel le premier dispositif envoie des demandes de géolocalisation au second dispositif selon un ou plusieurs des critères prédéterminés suivants : en particulier au début ou à la fin d'une activité, et/ou en cas de changement de niveau d'activité, et/ou après N1 pas depuis la dernière demande, et/ou après X1 minutes depuis la dernière demande.

4. Procédé selon l'une des revendications 1 à 3, dans lequel dans l'étape -d- c'est le second dispositif (2) qui calcule la première distance parcourue, D12, et envoie celle-ci au premier dispositif (1), ce dernier effectuant les étapes -e1-, -e2- et -e3-.

5. Procédé selon la revendication 4, dans lequel dans l'étape -d-, la première distance parcourue, D12, est calculée sous la forme d'une distance géométrique entre les première et seconde géolocalisations (A1, A2).

6. Procédé selon la revendication 4, dans lequel la fonction de géolocalisation du second dispositif (2) comprend l'accès à une base de données cartographiques, et dans lequel le second dispositif (2) calcule, au moyen de l'accès à la base de données cartographiques, la distance réelle parcourue par l'utilisateur le long de l'itinéraire cartographique entre les première et seconde géolocalisations A1, A2.

7. Procédé selon l'une des revendications 1 à 6, dans lequel le procédé comprend en outre, entre les étapes -b- et -c-, une étape de détermination d'une ou plusieurs géolocalisations intermédiaires (A3) entre les première et seconde géolocalisations, le calcul de distance additionnant ensuite les distances entre les géolocalisations intermédiaires successives.

8. Procédé selon l'une quelconque des revendications 1 à 7, dans lequel la fonction de géolocalisation du second dispositif est fournie par un récepteur GPS.

9. Procédé selon l'une quelconque des revendications 1 à 7, dans lequel la fonction de géolocalisation du second dispositif (2) est fournie par la détermination de signaux d'antenne provenant d'antennes d'emplacement connu, en particulier les antennes de réseaux de téléphonie cellulaire, les antennes de points d'accès Wifi, ou équivalents.

10. Procédé selon la revendication 9, dans lequel les signaux d'antenne sont complétés dans le second dispositif par l'utilisation d'un magnétomètre ou d'un gyroscope.

11. Procédé selon la revendication 1, dans lequel, après chaque détermination de géolocalisation, le second dispositif (2) envoie les coordonnées géographiques des première et seconde géolocalisations au premier dispositif, ledit premier dispositif effectuant ensuite les étapes -d-, -e1-, -e2- et -e3.

12. Procédé selon la revendication 11, dans lequel le second dispositif (2) envoie au premier dispositif, spontanément à intervalles réguliers (Ti), les coordonnées géographiques de la géolocalisation courante de l'utilisateur.

13. Procédé selon la revendication 1, dans lequel l'étape -d- est effectuée par le second dispositif.

14. Procédé selon l'une quelconque des revendications précédentes, dans lequel une base de données est fournie qui relate une pluralité de données de géolocalisation et un type d'activité d'utilisateur, afin d'améliorer la détermination de la foulée moyenne de l'utilisateur.

15. Système d'information pour un utilisateur, comprenant un premier dispositif (1) électronique portable constitué d'un moniteur d'activité personnel (1) destiné à être associé de manière sécurisée au corps de l'utilisateur, ayant un poids inférieur à 50 grammes et sans son propre moyen de géolocalisation, et un second dispositif (2) électronique portable constitué d'un téléphone intelligent (2) équipé d'une fonction de géolocalisation, les premier et second dispositifs étant des dispositifs physiquement indépendants configurés pour échanger des données sur une connexion sans fil, le premier dispositif comportant dans une mémoire (47) différentes valeurs de pas moyen (MKO-U) selon les différents types d'activité, pour l'utilisateur auquel le premier dispositif est associé

- le premier dispositif (1) étant configuré pour mesurer les signaux d'accélérations subies et pour compter de manière substantiellement continue les pas ou les cycles de l'utilisateur,
- le second dispositif étant configuré pour déterminer la géolocalisation courante de l'utilisateur à un premier instant (T1), qui constitue la première géolocalisation (A1),
- le second dispositif étant configuré pour déterminer la géolocalisation courante de l'utilisateur à un second instant (T2), qui constitue la seconde géolocalisation (A2),
- le second dispositif étant configuré pour calculer une première distance parcourue entre les géolocalisations (A1, A2),
- le premier dispositif étant configuré pour calculer, en utilisant ladite première distance parcourue D12 et le nombre de pas effectués entre les première et seconde géolocalisations (A1, A2), la foulée moyenne et/ou le pas moyen (MKO-Ui) et/ou le braquet moyen de l'utilisateur entre les première et seconde géolocalisations, moyennant quoi le premier dispositif est configuré pour affiner les valeurs de pas et de foulée moyens pour cet utilisateur particulier.

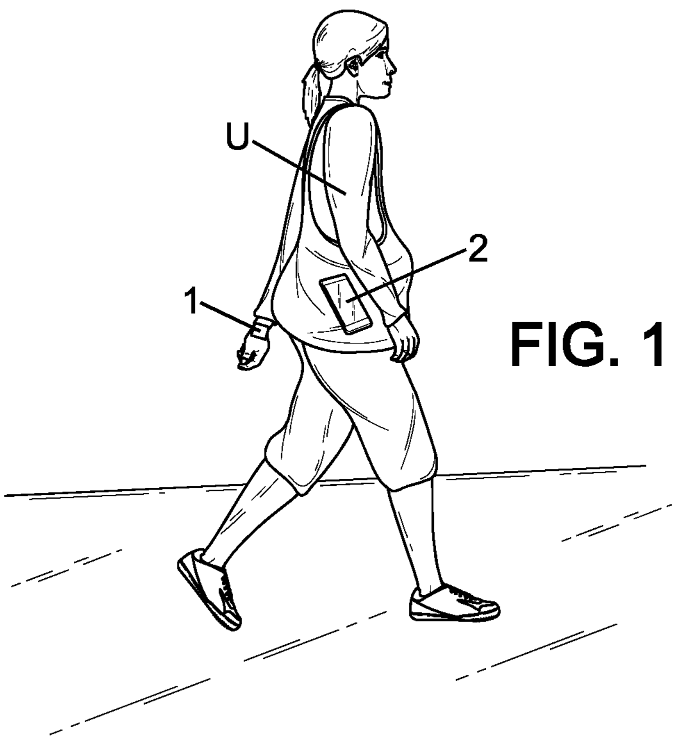

FIG. 1

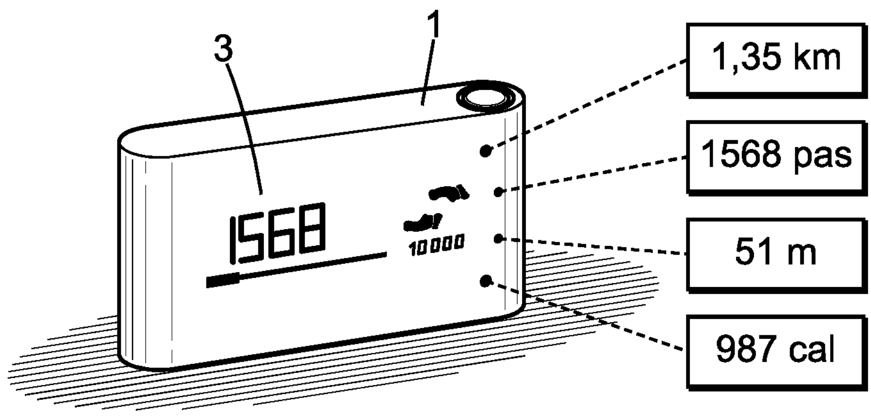

FIG. 2

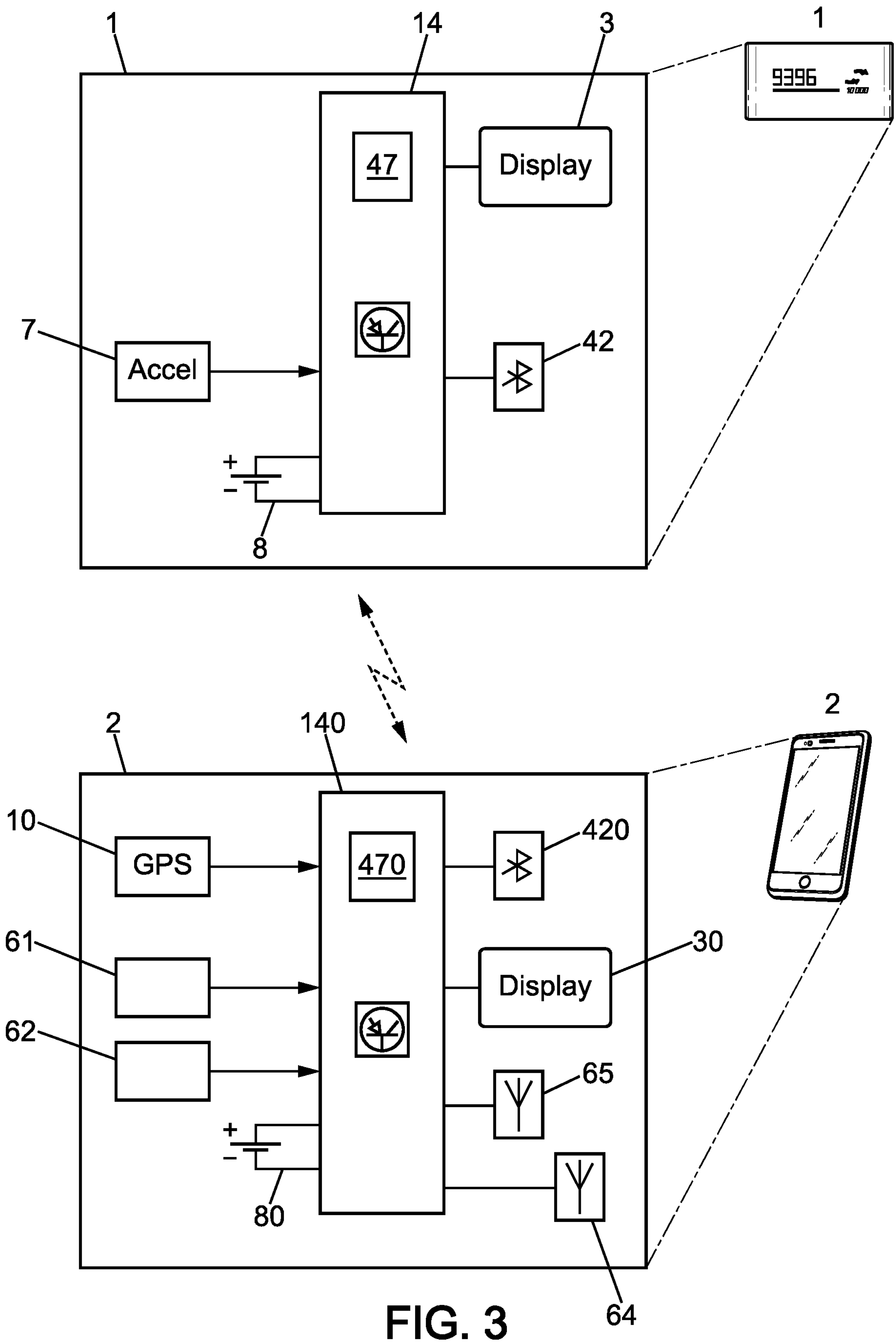
1
14
3
1
9396
10000
47
Display
7
Accel
42
8
2
140
2
10
GPS
470
420
61
Display
30
62
65
80
64

FIG. 3

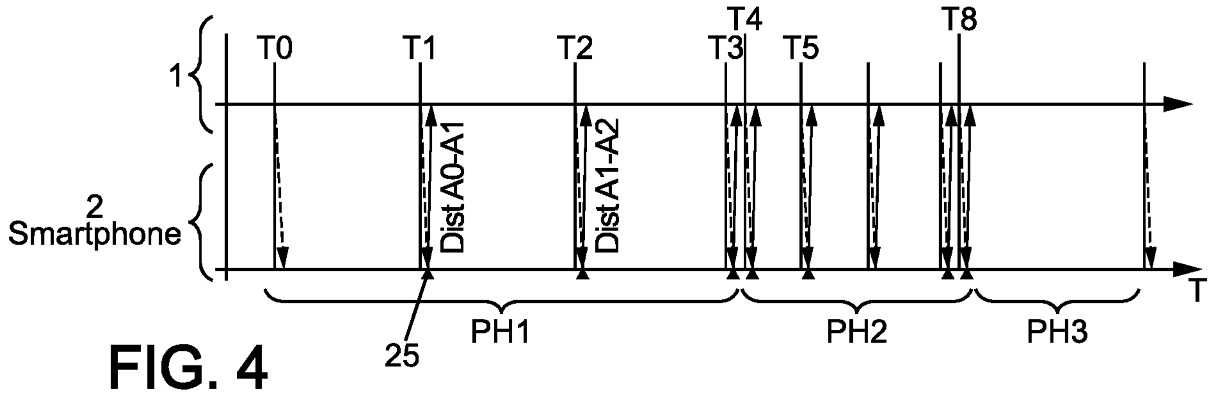

FIG. 4

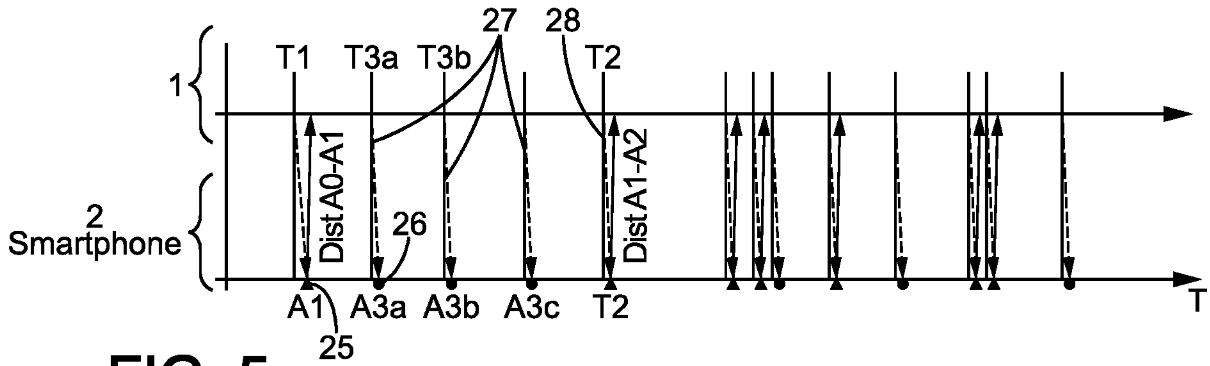

FIG. 5

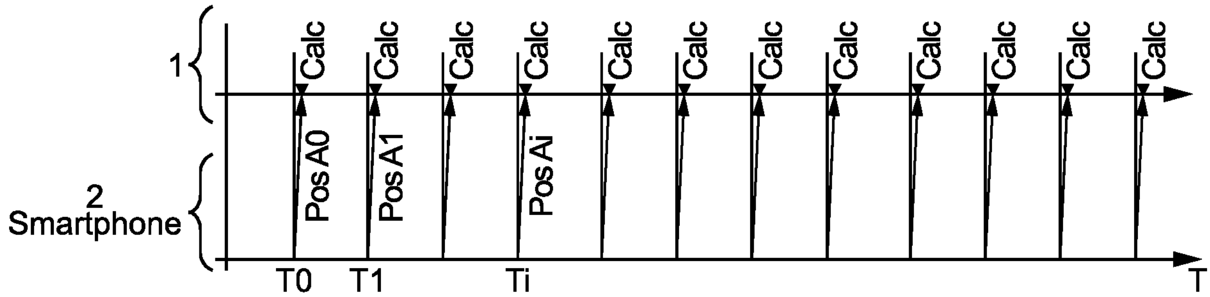

FIG. 6

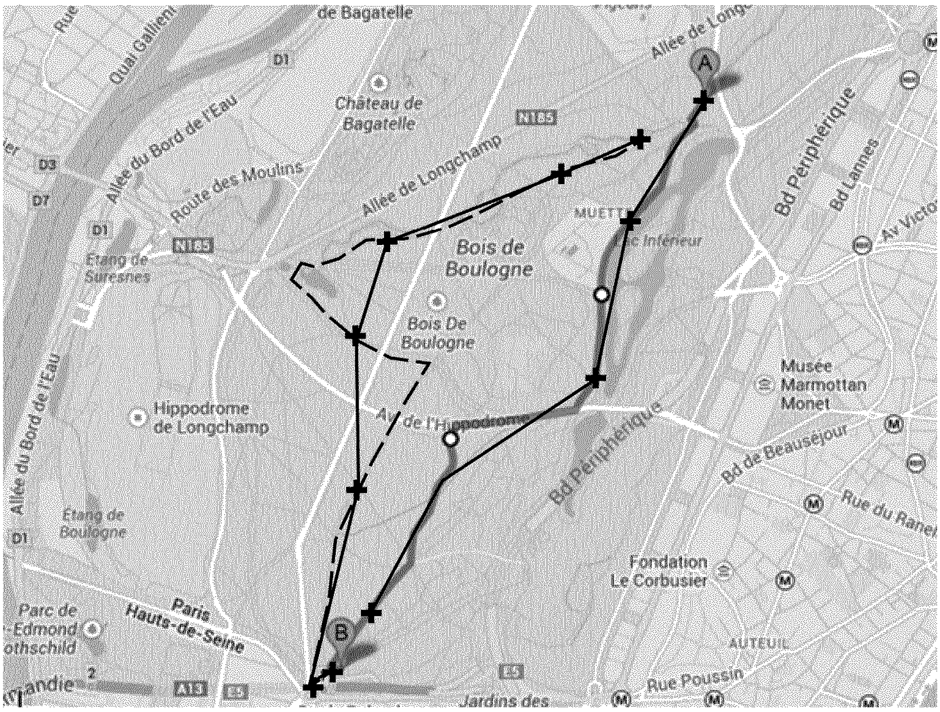
de Bagatelle
Quai Gallieni
Château de Bagatelle
N185
Allée de Longchamp
Route des Moulins
Allée du Bord de l'Eau
Etang de Suresnes
Bois de Boulogne
Bois De Boulogne
MUETTE
Lac Inférieur
Bd Périphérique
Bd Lannes
Av Victo
Musée Marmottan Monet
Hippodrome de Longchamp
Av de l'Hippodrome
Bd de Beauséjour
Rue du Ranel
Etang de Boulogne
Fondation Le Corbusier
Parc de -Edmond othschild
Paris
Hauts-de-Seine
AUTEUIL
Rue Poussin
Jardins des
A
B

FIG. 7

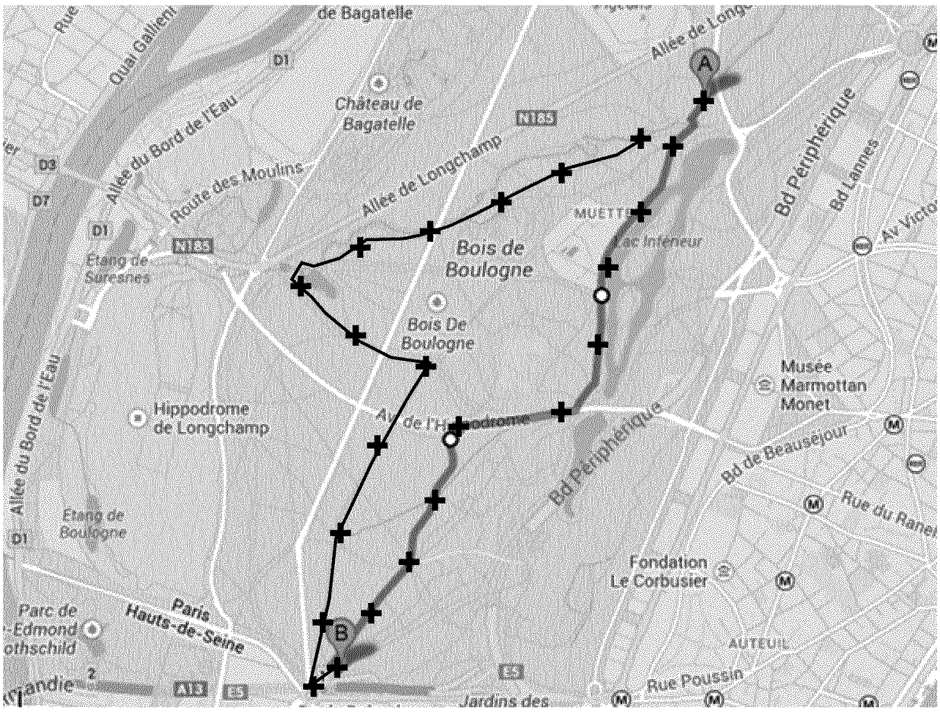
de Bagatelle
Quai Gallieni
Château de Bagatelle
N185
Allée de Longchamp
Route des Moulins
Allée du Bord de l'Eau
Etang de Suresnes
Bois de Boulogne
Bois De Boulogne
MUETTE
Lac Inférieur
Bd Périphérique
Bd Lannes
Av Victo
Musée Marmottan Monet
Hippodrome de Longchamp
Av de l'Hippodrome
Bd de Beauséjour
Rue du Ranel
Etang de Boulogne
Fondation Le Corbusier
Parc de -Edmond othschild
Paris
Hauts-de-Seine
AUTEUIL
Rue Poussin
Jardins des
A
B

FIG. 8

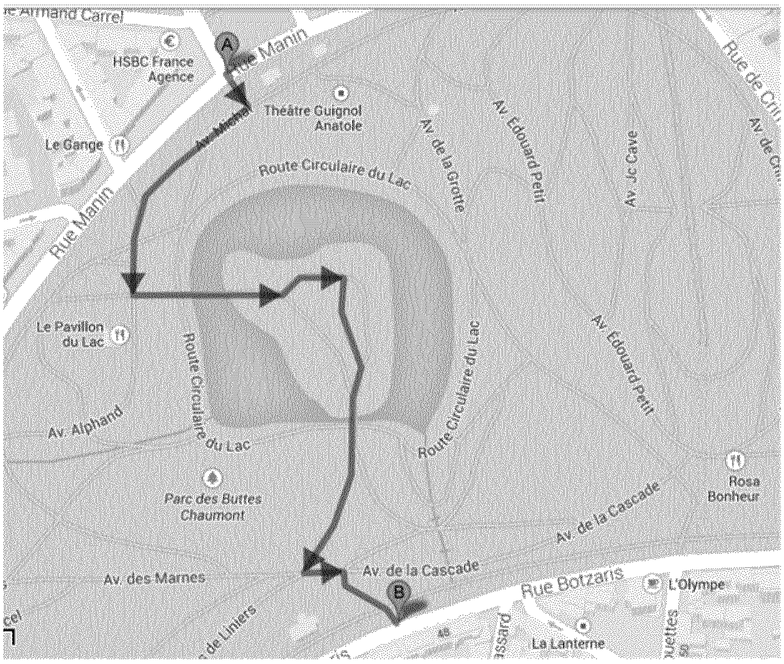
Armand Carrel
HSBC France Agence
Rue Manin
Théâtre Guignol Anatole
Av. Mathurin Moreau
Le Gange
Route Circulaire du Lac
Av. de la Grotte
Av. Edouard Petit
Av. Jc Cave
Rue Manin
Le Pavillon du Lac
Route Circulaire du Lac
Av. Edouard Petit
Av. Alphand
Route Circulaire du Lac
Parc des Buttes Chaumont
Rosa Bonheur
Av. de la Cascade
Av. des Marnes
Av. de la Cascade
Rue Botzaris
L'Olympe
de Liniers
La Lanterne
A
B

FIG. 9

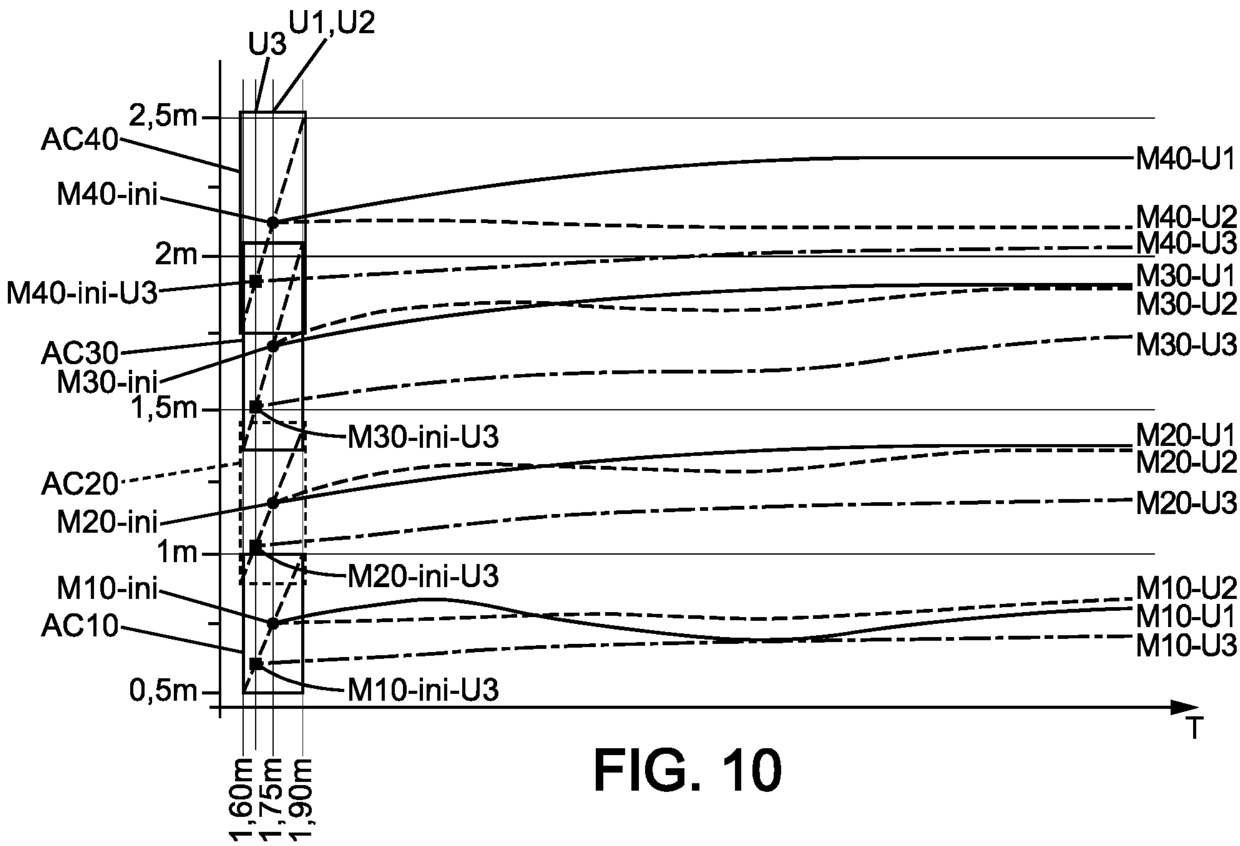
U3
U1,U2
2,5m
2m
1,5m
1m
0,5m
AC40
M40-ini
M40-ini-U3
AC30
M30-ini
M30-ini-U3
AC20
M20-ini
M20-ini-U3
M10-ini
AC10
M10-ini-U3
M40-U1
M40-U2
M40-U3
M30-U1
M30-U2
M30-U3
M20-U1
M20-U2
M20-U3
M10-U2
M10-U1
M10-U3
T
1,60m
1,75m
1,90m

FIG. 10

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 20130325404 A **[0004]**

patsnap

专利名称(译)	计算用户活动的方法
公开(公告)号	[EP2947588B1]()
公开(公告)日	2020-04-15
申请号	EP2015168189
申请日	2015-05-19
[标]申请(专利权)人(译)	WITHINGS
申请(专利权)人(译)	WITHINGS
当前申请(专利权)人(译)	WITHINGS
[标]发明人	SAADI RACHID BUARD NADINE HUTCHINGS CEIC
发明人	SAADI, RACHID BUARD, NADINE HUTCHINGS, CÉDRIC
IPC分类号	G16H20/30 A61B5/11 A61B5/00
CPC分类号	G01C22/006 G01S19/19 G01S19/49 G16H20/30 A61B5/1118 A61B5/1123 A61B5/4866 A61B5/6898 G01C22/00 G01P15/02
优先权	2014054498 2014-05-20 FR
其他公开文献	EP2947588A1
外部链接	[Espacenet]()

摘要(译)

用于计算用户活动的方法，所述方法由旨在与用户的身体安全相关联的个人活动监视器（1）以及配备有地理定位功能的智能手机（2）实施，该智能活动通过地理信息交换功能 无线连接，该方法包括以下步骤：-a-活动监视器检测并计算用户的步骤，-b-智能手机在第一时间（T1）确定第一地理位置（A1），-c-智能手机 确定第二时间（T2）的第二地理位置（A2），-d-两个设备（1,2）中的一个计算出两个地理位置（A1，A2）之间的行进距离D12，-e-两个设备之一 设备（1,2）根据行进的距离D12和两个地理位置（A1，A2）之间采取的步数计算用户的平均步幅和/或平均步数。

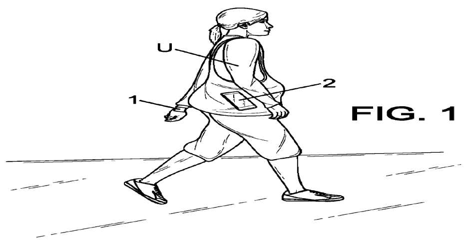

FIG. 1

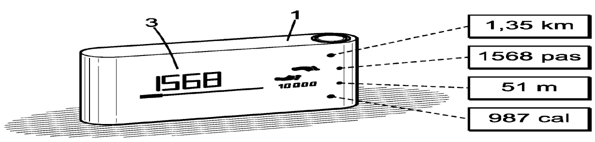

FIG. 2