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

(11) EP 1 367 940 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
11.05.2005 Bulletin 2005/19

(21) Application number: **02716904.4**

(22) Date of filing: **11.03.2002**

(51) Int Cl.[7]: **A61B 5/11**, A61B 5/22

(86) International application number:
PCT/GB2002/001102

(87) International publication number:
WO 2002/071945 (19.09.2002 Gazette 2002/38)

(54) **ACTIVITY MONITOR**

AKTIVITÄTSÜBERWACHUNG

MONITEUR D'ACTIVITE

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR

(30) Priority: **12.03.2001 GB 0106037**

(43) Date of publication of application:
10.12.2003 Bulletin 2003/50

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- **GLASER R M: "A SYSTEM FOR MONITORING DAILY AMBULATORY ACTIVITY" PROCEEDINGS OF THE ANNUAL CONFERENCE OF THE IEEE / ENGINEERING IN MEDICINE AND BIOLOGY SOCIETY. FORT WORTH, NOV. 7 - 10, 1986, PROCEEDINGS OF THE ANNUAL INTERNATIONAL CONFERENCE OF THE ENGINEERING IN MEDICINE AND BIOLOGY SOCIETY, NEW YORK, IEEE, US, vol. 1 CONF. 8, 7 November 1986 (1986-11-07), pages 579-583, XP002005517**

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Description

[0001] The present invention relates to monitoring and recording the activity of a subject.

[0002] The present invention may be used in a variety of applications that require the assessment of an individual's daily activity in an unconstrained environment. Users of such an apparatus may include health practitioners, who can use the information provided by the device to determine a patient's compliance to a prescribed exercise routine and may further help the patient by motivating them to achieve set targets. Individuals can use the apparatus as a motivational aid to be more active, whilst the apparatus can also be used to provide a convenient means to measure and compare a subject's calorie expenditure with respect to their calorie intake. This device may be further utilised by Clinical Research Organisations who require tools that can provide data to demonstrate the efficacy of new drugs and medical interventions of clinical trials.

[0003] In the healthcare field any intervention associated with a mobility or co-morbidity factor can take advantage of the information given by the device. One such example of where this could be used is to address the issue of the growing evidence of type II diabetes, which can be linked to both obesity and inactivity. Furthermore achieving a general reduction in morbidity is important to the nation as increased ill health is expensive to treat, reduces the work force and decreases quality of life to those affected. This device provides a powerful tool for assessing the impact of mobility and sedentary lifestyles on health.

[0004] Devices that measure the activity of a person are well known in the art. Such devices include goniometers which allow continuous measurement of a joint angle, however, the data produced by a single goniometer cannot provide postural information and thus will not be able to assess between the different activities of the user. In addition goniometers are generally not used for long term recordings of unconstrained activities.

[0005] Other types of devices available are pedometers which count the number of steps taken in a given period of time and which are normally worn on the waist or ankle. The more sophisticated pedometers make a crude relationship between steps taken and calories used, however, are unable to discriminate between an upright and seated posture and do not record the rate of stepping, only the total number of steps.

[0006] Also available are actometers which utilise accelerometers to detect motion, these are similar to pedometers and can be worn on the wrist. These devices may include sophisticated algorithms that infer energy expenditure from the sensor output and most recently such devices have been mounted in the instep of footwear, with claims of the ability to measure the distance and speed of walking and running.

[0007] In addition, heart rate monitors are widely used to measure the intensity of exercise performed and while one such monitor presently exists with a calorie function, the calorie function only operates on elevated heart rates over 100 beats per minute, so only estimates the calories used during exercise.

[0008] None of the above mentioned devices can provide the data needed to evaluate a number of medical interventions, that is to say, provide results that indicate that the intervention has reduced the persons mobility handicap.

[0009] It is amongst the objects of the present invention, to provide an activity profiler that obviates or mitigates one of the aforementioned disadvantages.

[0010] According to a first aspect of the present invention there is provided a system for monitoring and recording the activity of a subject, the system comprising a first portable device adapted to be worn by the subject and arranged to record data representative of body position of the subject, and a second device used to assess the data recorded by the first portable device, so as to categorise said recorded data into activities including sitting, standing and walking; said first device comprising:

a single sensing means, adapted to be maintained in a single location about the thigh;
a recording means for storing data from said sensing means;
and a power source to supply both the sensing means and recording means;
said second device comprising a processing means capable of connection to the first device for analysing and classifying said data into discrete activities.

[0011] Thus in use the system can monitor a subject's activity over a period of time, which may be a period of days or weeks, and can classify and quantify said activities into periods spent sitting, standing and walking.

[0012] Preferably the sensor is an accelerometer in which a signal is generated that reflects inclination of the thigh.

[0013] Preferably the processing means has a set of threshold levels that when applied to the recorded data can be used to distinguish between a seated and an upright posture of the subject.

[0014] The threshold levels may be pre-set but, most preferably, the processing means calculates the threshold levels from the recorded data for the particular subject so that the different postures of the subject can be determined.

[0015] Preferably the recording means is configured such that it continuously monitors an aspect of the subject's body position.

[0016] Conveniently the recording means stores data from the single sensing means at a sampling rate of 10Hz.

[0017] Conveniently the recording means also records the time when the activities are performed by time stamping the recorded data.

[0018] Preferably the processing means is programmed to calculate for each activity the total accumulative duration periods.

[0019] Conveniently the processing means is programmed such that it can further distinguish the data of the identified walking activity in order to produce information relating to the cadence (rhythm) and total number of steps for said walking activity.

[0020] Preferably the processing means is programmed such that it can calculate an estimate of the calorific expenditure of the subject for a specified period.

[0021] The recording means and the processing means may be combined to form a single portable module that can be worn by a user. The second device may have a user interface comprising a screen and keys to access information.

[0022] Alternatively, the functional process of the processing means is supplied in the form of a computer software package that can be loaded on to a suitable apparatus, such as a personal computer or the like in which case the second device is remote from the first device.

[0023] According to a second aspect of the present invention there is provided a method of recording data relating to the posture of a subject and assessing the data so as to categorise said data into activities including sitting, walking and standing, said method comprising:

sensing the movement of the thigh by use of a single sensor;
recording the movement of the thigh; and
processing the data so as to classify the data into discrete ones of said activities.

[0024] Preferably the method includes the step of calculating the threshold levels from the data recorded, such that the data can be further processed to determine the primary postures of the subject.

[0025] An embodiment of the present invention will now be described by way of example, with reference to the accompanying drawings, in which:

Figure 1a depicts a first portable device of the system in accordance with the present invention as worn by a user;
Figure 1b is a block diagram of the first portable device which includes a sensor;
Figure 2 is a block diagram showing one embodiment of the system in accordance with the present invention;
Figure 3a is a waveform showing different signals typically produced from the output of the sensor of Figure 1b;
Figure 3b shows the waveform of Figure 3a after being passed through a low pass filter;
Figure 3c shows the waveform of Figure 3b after being rectified about a threshold;
Figure 3d shows the waveform of Figure 3c after being passed through a low pass filter to identify a walking period;
Figure 4 is a histogram of occurrence of amplitudes of the sensor output waveform shown in Figure 3a; and
Figure 5 shows a time-expanded portion of the Figure 3c waveform.

[0026] Referring firstly to Figure 1a and 1b, there is shown one embodiment of a system in accordance with the present invention part of which is as worn by a user. The system comprises a first portable device 10 which is maintained in a set location on the thigh of the user, preferably 5cm above the patella, by means of a strap 13, sticky tape or specially designed pair of body pants (having a specially designed pocket to house the first portable device 10) such that the device 10 remains in constant contact with the thigh and neither rotates around nor slips down the thigh. The first portable device 10 as shown in Figure 1b, comprises a data logger 16, which is configured to record data representative of body position of the user (or subject) every 1/10th of a second thus achieving a sampling rate of 10Hz, a sensing means 12 and a power supply 18 to power both the data logger 16 and sensing means 12. The sensing means 12 is preferably a single uni-axial accelerometer which is located mid-line of the thigh, such that the axis of sensitivity of the accelerometer is in the sagittal plane, making it sensitive to the inclination of the thigh.

[0027] The first portable device 10 is internally configured such that it transfers power to the sensing means 12 from the power supply 18 and relays a data signal to the data logger 16 from the sensing means 12. Before being stored on the data logger 16, the signal emanating from the sensing means 12 is first pre-filtered using a low pass anti-aliasing filter, so as to remove any unwanted high frequency transients.

[0028] Whilst this embodiment illustrates a first portable device 10 formed into a single unit such that it can be worn on the leg of a user, alternative embodiments are also envisaged. The first portable device 10 may be formed such that the sensor 12 is mounted on the thigh and communicates to a data logger 16 and battery 18 located on the waist of the user, for example by means of a cable, or a form of wireless communication.

[0029] In Figure 2 there is shown a second device which takes the form of a processing means 22 connected by way of a data cable 20 to the data logger 16. Once the data has been downloaded to the processing means 22 it is possible to analyse the data by use of specific algorithms to assess the data recorded by device 10 so as to categorise the recorded data into activities including sitting, standing and walking. Whilst in this embodiment data is shown to be transferred between the data logger 16 and processor 22 by a data cable 20, other embodiments of the present invention include wireless means for the transfer of said data.

[0030] The steps of the algorithms are to calculate two threshold levels for the acquired data, these threshold levels are then used to categorise the data into representations of upright and seated periods of the user. The identified upright data is then classified into active or quiet periods, in which the active periods are further classified according to speed or vigour. With the data logger 16 configured to record the time of data acquisition it is possible to analyse specific periods of the day, and this data can be used to estimate the calorie expenditure of the subject.

[0031] Figure 3a shows a typical output waveform generated by the sensing means 12, where A represents a period in a seated posture, B represents a period maintained in a standing posture and C represents an upright active period. It can be seen that the signal for the standing posture B is not clearly distinguishable as a discrete value, therefore, the processor 22 is used to computate a discrete dc component E for said standing posture B. In a similar manner a discrete dc component D is also calculated for the seated posture A. The two discrete dc components D, E are defined as the threshold levels and are used to distinguish between the two primary postures, that is to say the seated posture and the upright posture, for the recorded data.

[0032] The calculation of the threshold levels D,E is the first operation that is performed once the data has been downloaded into the processing means 22. The method of determining the threshold levels D,E is by manipulating the data as shown in Figure 4, wherein Figure 4 shows a histogram of the occurrence of amplitudes of the output of the sensing means 12. From Figure 4 the processing means 22 determines the most frequently occurring amplitudes around the seated and upright postures, and these values are used as the threshold levels. In Figure 4 the data shown on the histogram between 120 and 130 on the horizontal axis, which represents the thigh in a horizontal position, indicates the occurrence of amplitudes of the output signal of the sensing means 12 for a subject in a seated position and the most frequently occurring amplitude D would be used as the threshold level for the seated posture. Similarly the data shown around 140 on the horizontal axis, which represents the thigh in a substantially vertical position, indicates the occurrence of amplitudes of the output signal of the sensing means 12 for a subject standing or walking and the peak amplitude E would be used for the threshold level for the standing posture.

[0033] Once the threshold levels D,E have been calculated, the second step is to classify the entire data record into upright and seated postures according to the calculated threshold levels D,E. This step is performed by first passing the signal of Figure 3a through a low pass filter, of around 10Hz, so as to produce a waveform as shown in Figure 3b to remove the high frequency oscillations, and noise, caused by heel-striking of the user during walking, as represented at C in Figure 3a. This filtered signal is then classified into periods of upright and seated postures by use of the threshold levels, D, E. The classification process can be performed by several methods including the use of comparators, band stop filters or the like. This process step allows the processing means 22 to classify the data such that it can determine and calculate the total accumulative periods for the seated and upright periods and is further used as a mask to identify the upright periods so that these upright periods can be further classified.

[0034] The third operation that is performed is to separate the identified upright posture classification into active and quiet periods. This is achieved by using the results obtained in the second step as a mask to process the original unfiltered signal of Figure 3a, so as to obtain the upright periods from the original signal.

[0035] The previously identified upright portions of the filtered signal, that is to say the signal located around E as shown in Figure 3b are then rectified about the upright threshold level E, so that the identified upright .activity located below the threshold level E is reflected above E. (Alternatively, this step can be performed by calculating the differential between the active period of the signal lying below the threshold E and adding the modulus of these differential values to E.) This results in the waveform as shown in Figure 3c, where all the upright activity is represented by a signal above the threshold level E. The rectified signal is then low pass filtered using a moving average filter, to remove the oscillations as shown in Figure 3d, and to produce an envelope C which corresponds to a discrete average signal for the walking period.

[0036] Thus, the oscillating signals represented by C in Figure 3a corresponding to walking, have been converted into a signal with a value greater than that of the upright threshold value E; the standing posture has a value equal to that of the threshold level E; and the sitting or lying position has a value equal to D. Transitions between standing and sitting are represented in the waveform by those transitions between the threshold levels D,E. The data as displayed in Figure 3d can now be categorised according to three activities, sitting/lying A, standing B and walking C.

[0037] The data of the identified walking period as processed and shown in Figure 3b can be further analysed. Figure 5 displays a portion of this data with an expanded timescale to allow the individual steps of the subject user to be visualised. Referring to Figure 5 a single step is represented by the occurrence of a double oscillation from one peak in the waveform to the second following peak, that is to say from a crest to the second following crest of the signal along the timescale, i.e. a step is as shown by H in Figure 5. By analysing this data the cadence (rhythm) and total number of steps can be calculated. The higher the frequency of the signal, that is to say the closer together the peaks are along the time scale, the faster the rhythm of the upright activity, which may be walking or indeed running. Conversely, the lower the frequency, or the further apart the peaks are along

the time scale, the lower is the pace or rhythm. Furthermore the excursions of the signal during each step can be analysed to discriminate the activity even further, that is to say the peak to peak amplitude G of a step is measured to classify the signal between walking and other high stepping activities, such as running or cycling, as during high stepping activities the higher inclinations of the thigh creates a larger peak-to-peak amplitude G generated by the sensing means 12.

[0038] Therefore, from the process steps taken by the processing means 22, to classify the recorded data into different activities, it is possible to determine an individual's activity during a normal day. The processor 22 can also calculate the amount of time spent performing different activities such as standing, walking and sitting and to estimate the calorie burn or energy expenditure of the subject by multiplying the time spent in each activity by an index of energy expenditure. The index of energy expenditure can be derived from published work and incorporates factors relating to the subject's height, weight and fitness. Separate values would be attributed to sitting, standing and walking. The walking value would be scaled according to the published values relating walking cadence with energy expenditure.

Claims

1. A system for recording data relating to the posture of a subject and assessing the data so as to categorise the data into activities, including sitting, walking and standing, the system comprising: a single sensor adapted to be maintained in a single location about the thigh and operable to generate a signal that reflects the inclination of the thigh; recording means for recording inclination sensitive data from the sensor, ahd a processor for processing the inclination sensitive data recorded so as to classify that data into discrete ones of said activities.

2. A system as claimed in claim 1, wherein the single sensor is sensitive to movement of the thigh.

3. A system as claimed in claim 1 or claim 2 wherein the processor includes a set of pre-set threshold levels that when applied to the recorded data distinguish between a seated and an upright posture of the subject.

4. A system as claimed in claim 3 wherein the processor is arranged to calculate the threshold levels from the recorded data so that the different postures of the subject can be determined.

5. A system as claimed in-any one of the preceding claims wherein the recording means is configured to continuously monitor the subject's body position.

6. A system as claimed in any of the preceding claims wherein the processor is operable to calculate the total accumulative duration periods for each activity.

7. A system as claimed in claim 6 wherein the processor is programmed to distinguish the data of the identified walking activity in order to produce information relating to the cadence or rhythm and total number of steps for said walking activity.

8. A system as claimed in any preceding claim wherein the processing means is programmed to calculate an estimate of the calorific expenditure of the subject for a specified period.

9. A system as claimed in any of the preceding claims wherein the single sensor and the recording means are included in a first device and the processor is provided in a second device that is capable of connection to the first device.

10. A method for recording data relating to the posture of a subject and assessing the data so as to categorise the data into activities, including sitting, walking and standing, the method comprising: maintaining a single sensor in a location about the thigh, the sensor being operable to generate a signal that reflects inclination of the thigh; storing inclination sensitive data from the sensor, and processing the data to classify that data into discrete ones of said activities.

11. A method as claimed in claim 10 comprising applying a set of pre-set threshold levels to the recorded data to distinguish between a seated and an upright posture of the subject.

12. A method as claimed in claim 10 comprising calculating the threshold levels from the recorded data so that the different postures of the subject can be determined.

13. A method as claimed in any of claims 10 to 12 comprising continuously monitoring the subject's body position.

14. A method as claimed in any of claims 10 to 13 comprising calculating the total accumulative duration periods for each activity.

Patentansprüche

1. System zum Aufzeichnen von Daten betreffend die Positur eines Subjekts und zum Bewerten der Daten, um so die Daten in Aktivitäten, umfassend Sitzen, Gehen und Stehen, zu kategorisieren, wobei das System umfasst: einen einzigen Sensor, wel-

cher ausgebildet ist, an einem einzigen Ort über dem Oberschenkel gehalten zu werden und betreibbar ist, um ein Signal zu erzeugen, welches die Neigung des Oberschenkels widerspiegelt; Aufzeichnungsmittel zum Aufzeichnen von Neigungssensitiven Daten von dem Sensor, und einen Prozessor zum Bearbeiten der aufgezeichneten Neigungs-sensitiven Daten, um so diese Daten in einzelne der Aktivitäten zu klassifizieren.

2. System nach Anspruch 1, wobei der einzige Sensor sensitiv auf Bewegung des Oberschenkels ist.

3. System nach Anspruch 1 oder 2, wobei der Prozessor einen Satz von voreingestellten Schwellwerten umfasst, welche bei Anwendung auf die aufgezeichneten Daten zwischen einer Sitz-Positur und einer aufrechten Positur des Subjekts unterscheiden.

4. System nach Anspruch 3, wobei der Prozessor ausgebildet ist, um die Schwellwerte aus den aufgezeichneten Daten zu berechnen, so daß die unterschiedlichen Posituren des Subjekts bestimmt werden können.

5. System nach einem der vorangegangenen Ansprüche, wobei die Aufzeichnungsmittel konfiguriert sind, um die Körperposition des Subjekts kontinuierlich zu überwachen.

6. System nach einem der vorangegangenen Ansprüche, wobei der Prozessor betreibbar ist, um die akkumulierte Gesamtdauer für jede Aktivität zu berechnen.

7. System nach Anspruch 6, wobei der Prozessor programmiert ist, um die Daten der identifizierten Geh-Aktivität zu unterscheiden, um Information betreffend die Abfolge oder Rhythmus und die Gesamtzahl der Schritte für die Geh-Aktivität zu erzeugen.

8. System nach einem der vorangegangenen Ansprüche, wobei die Bearbeitungsmittel programmiert sind, um eine Abschätzung des kalorienmäßigen Verbrauchs des Subjekts für eine spezifizierte Periode zu berechnen.

9. System nach einem der vorangegangenen Ansprüche, wobei der einzige Sensor und die Aufzeichnungsmittel in einer ersten Vorrichtung enthalten sind und der Prozessor in einer zweiten Vorrichtung angeordnet ist, welche mit der ersten Vorrichtung verbunden werden kann.

10. Verfahren zum Aufzeichnen von Daten betreffend die Positur eines Subjekts und zum Bewerten der Daten, um so die Daten zu klassifizieren, umfassend Sitzen, Gehen und Stehen, wobei das Verfahren umfasst: Haltern eines einzigen Sensors an einem Ort über dem Oberschenkel, wobei der Sensor betreibbar ist, um ein Signal zu erzeugen, welches die Neigung des Oberschenkels widerspiegelt; Speichern von Neigungs-sensitiven Daten von dem Sensor, und Bearbeiten der aufgezeichneten Neigungs-sensitiven Daten, um diese Daten in diskrete Daten dieser Aktivitäten zu klassifizieren.

11. Verfahren nach Anspruch 10, umfassend Anwenden eines Satzes von voreingestellten Schwellwerten auf die aufgezeichneten Daten, um zwischen einer Sitz-Positur und einer aufrechten Positur des Subjekts zu unterscheiden.

12. Verfahren nach Anspruch 10, umfassend Berechnen der Schwellwerte aus den aufgezeichneten Daten, so daß die unterschiedlichen Posituren des Subjekts bestimmt werden können.

13. Verfahren nach einem der Ansprüche 10 bis 12, umfassend kontinuierliches Überwachen der Körperposition des Subjekts.

14. Verfahren nach einem der Ansprüche 10 bis 13, umfassend Berechnen der akkumulierten Gesamtdauer für jede Aktivität.

Revendications

1. Système pour enregistrer des données concernant la posture d'un sujet et pour estimer les données de manière à classer les données en des activités, comprenant la position assise, la marche et la position debout, le système comprenant : un capteur unique adapté pour être maintenu à un emplacement unique autour de la cuisse et pouvant être mis en oeuvre pour générer un signal qui reflète l'inclinaison de la cuisse ; des moyens d'enregistrement pour enregistrer des données sensibles à une inclinaison provenant du capteur, et un processeur pour traiter les données sensibles à une inclinaison enregistrées de manière à classer ces données en des activités discrètes parmi lesdites activités.

2. Système selon la revendication 1, dans lequel le capteur unique est sensible à un mouvement de la cuisse.

3. Système selon la revendication 1 ou la revendication 2, dans lequel le processeur comprend un ensemble de niveaux de seuil prédéterminés qui, lorsqu'ils sont appliqués aux données enregistrées, établissent une distinction entre une posture assise et une posture verticale du sujet.

4. Système selon la revendication 3, dans lequel le processeur est agencé pour calculer les niveaux de seuil à partir des données enregistrées de sorte que les différentes postures du sujet puissent être déterminées.

5. Système selon l'une quelconque des revendications précédentes, dans lequel les moyens d'enregistrement sont configurés pour surveiller continûment la position du corps du sujet.

6. Système selon l'une quelconque des revendications précédentes, dans lequel le processeur peut être mis en oeuvre pour calculer les périodes de durées cumulées totales de chaque activité.

7. Système selon la revendication 6, dans lequel le processeur est programmé pour distinguer les données de l'activité de marche identifiée afin de produire des informations concernant la cadence ou le rythme et un nombre total de pas pendant ladite activité de marche.

8. Système selon l'une quelconque des revendications précédentes, dans lequel les moyens de traitement sont programmés pour calculer une estimation d'une dépense de calories du sujet pendant une période spécifiée.

9. Système selon l'une quelconque des revendications précédentes, dans lequel le capteur unique et les moyens d'enregistrement sont inclus dans un premier dispositif, et le processeur est prévu dans un deuxième dispositif qui est capable d'établir une connexion avec le premier dispositif.

10. Procédé pour enregistrer des données concernant la posture d'un sujet et pour estimer les données de manière à classer les données en des activités, comprenant la position assise, la marche et la position debout, le procédé comprenant : le maintien d'un capteur unique à un emplacement autour de la cuisse, le capteur pouvant être mis en oeuvre pour générer un signal qui reflète une inclinaison de la cuisse ; la mémorisation de données sensibles à une inclinaison provenant du capteur et le traitement des données pour classer ces données en des activités discrètes parmi lesdites activités.

11. Procédé selon la revendication 10, comprenant l'application d'un ensemble de niveaux de seuil prédéfinis aux données enregistrées pour établir une distinction entre une posture assise et une posture verticale du sujet.

12. Procédé selon la revendication 10, comprenant le calcul des niveaux de seuils à partir des données enregistrées de sorte que les différentes postures du sujet puissent être déterminées.

13. Procédé selon l'une quelconque des revendications 10 à 12, comprenant une surveillance continue de la position du corps du sujet.

14. Procédé selon l'une quelconque des revendications 10 à 13, comprenant le calcul des périodes de durées cumulées totales de chaque activité.

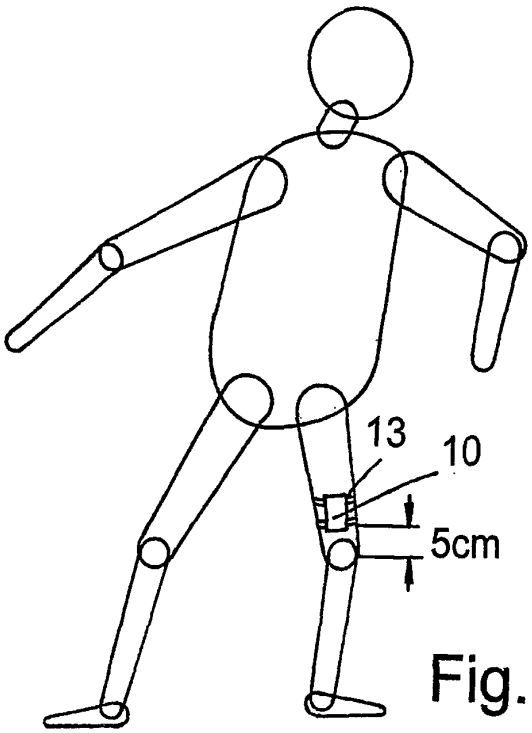

Fig. 1a

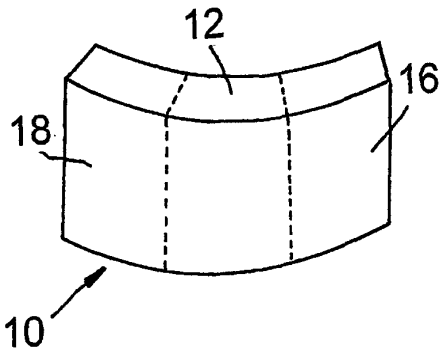

Fig. 1b

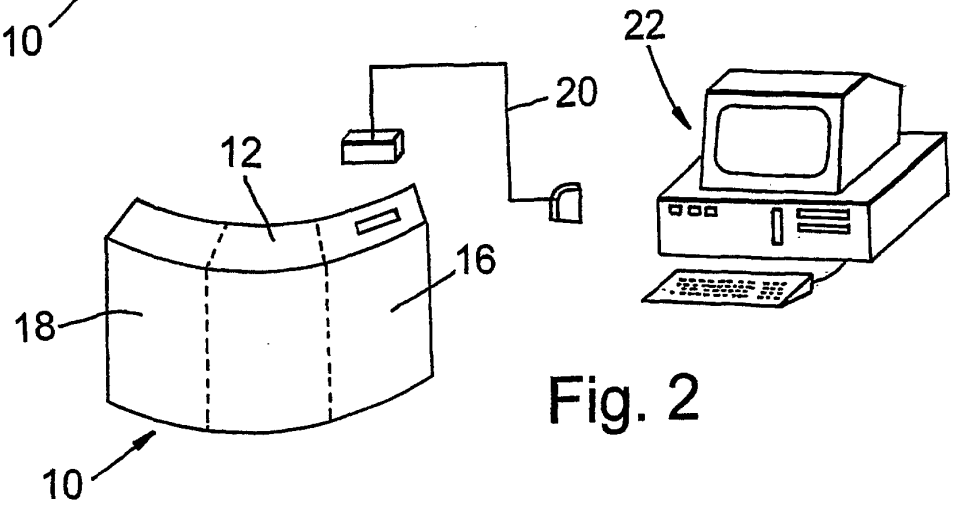

Fig. 2

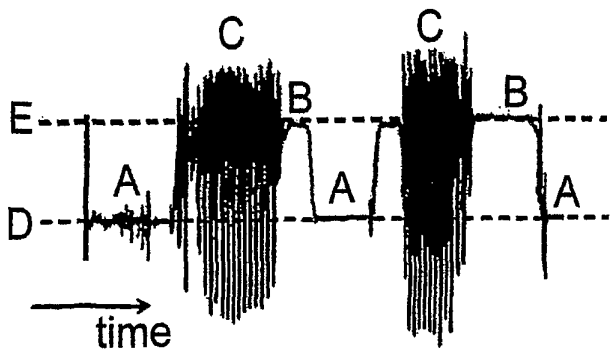

Fig. 3a

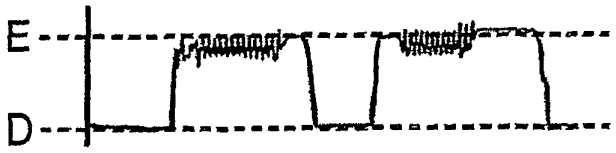

Fig. 3b

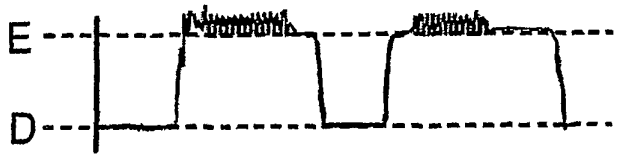

Fig. 3c

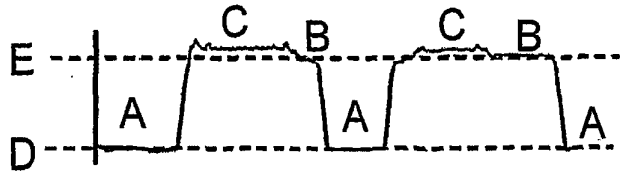

Fig. 3d

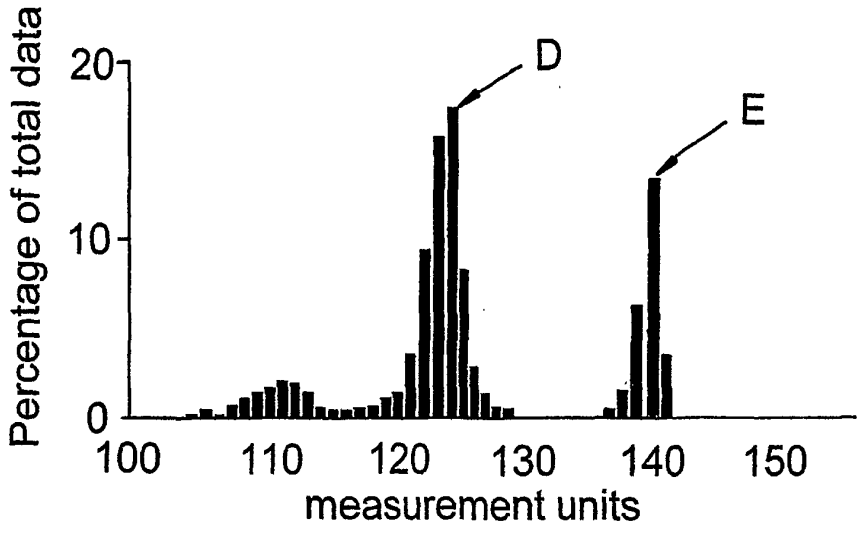
Percentage of total data
20
10
0
D
E
100
110
120
130
140
150
measurement units

Fig. 4

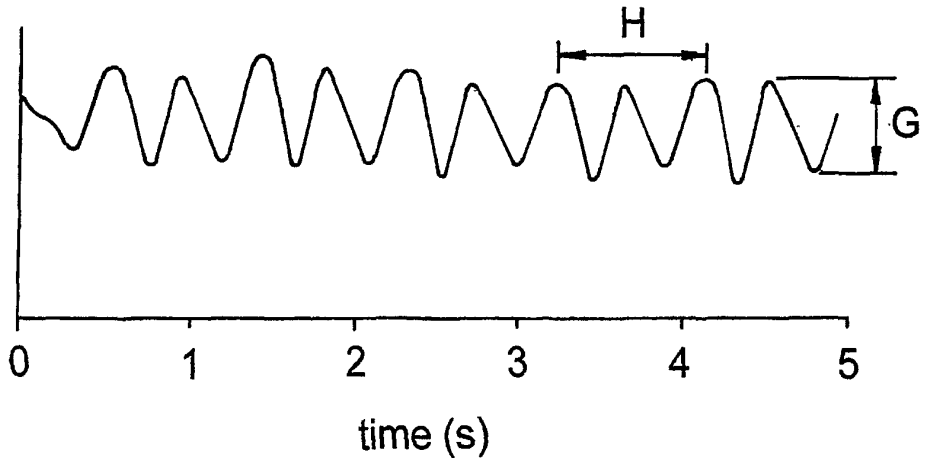
H
G
0
1
2
3
4
5
time (s)

Fig. 5

专利名称(译)	活动监视器		
公开(公告)号	EP1367940B1	公开(公告)日	2005-05-11
申请号	EP2002716904	申请日	2002-03-11
[标]申请(专利权)人(译)	斯特拉斯克莱德大学		
申请(专利权)人(译)	斯特拉斯克莱德大学		
当前申请(专利权)人(译)	斯特拉斯克莱德大学		
[标]发明人	MAXWELL DOUGLAS JAMES GRANAT MALCOLM HOWARD BARBENEL JOSEPH CYRIL		
发明人	MAXWELL, DOUGLAS, JAMES GRANAT, MALCOLM, HOWARD BARBENEL, JOSEPH, CYRIL		
IPC分类号	A61B5/00 A61B5/107 A61B5/11 A61B5/22		
CPC分类号	A61B5/1116 A61B5/1123 A61B5/22 A61B5/6828 A61B5/7264 G16H50/20		
优先权	2001006037 2001-03-12 GB		
其他公开文献	EP1367940A1		
外部链接	Espacenet		

摘要(译)

一种记录与受试者的姿势有关的数据并评估数据以便将所述数据分类为活动的方法，包括坐，走和站立。该方法包括通过使用单个传感器感测大腿的运动;记录大腿的运动;并处理数据以便将数据分类为离散的所述活动。

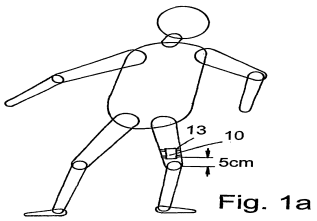

Fig. 1a

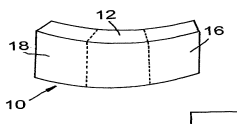

Fig. 1b

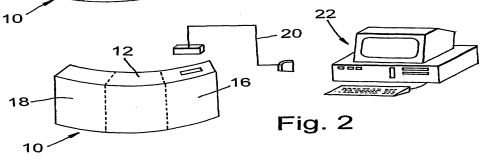

Fig. 2