



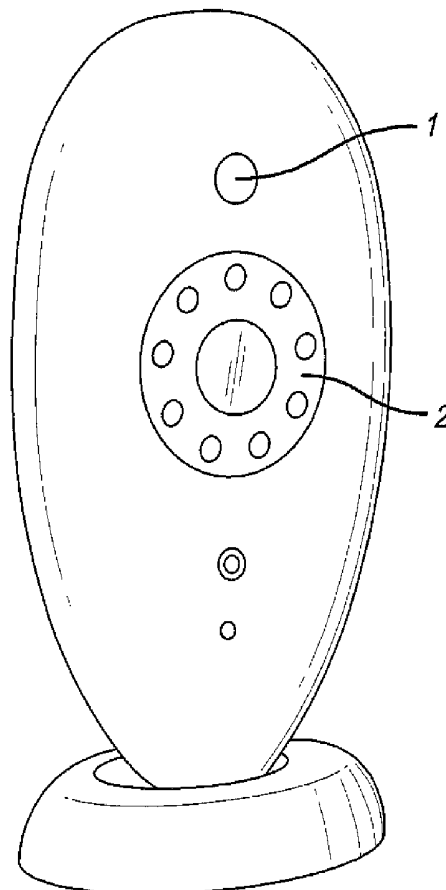
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YEN et al.(10) **Pub. No.: US 2017/0248478 A1**(43) **Pub. Date: Aug. 31, 2017**(54) **APPARATUS AND METHOD FOR
MEASURING BODY TEMPERATURE OF A
HUMAN BODY**(52) **U.S. CL.**
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(2013.01); **A61B 5/0082** (2013.01)(71) Applicants: **Ding Yuan YEN**, Kowloon (HK);
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Yuan YEN**, Brea, CA (US)(21) Appl. No.: **15/438,127**(22) Filed: **Feb. 21, 2017**(30) **Foreign Application Priority Data**

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The invention relates to an apparatus for measuring the human body temperature. It comprises of an infrared temperature sensor for performing temperature sampling on a plurality M×N of sampling points, M≥3, N≥3. The temperatures of the sampling points with temperatures within the effective temperature range of the human body are averaged to obtain the body temperature of the human body. By collecting the temperatures of a plurality of sampling points of the measured object, the invention effectively avoids the errors that measurement of single point may produce (as may be caused by factors such as the environment); by screening for temperatures within the effective temperature range of the human body, the invention effectively avoids errors or interference produced by factors such as clothing or the environment. The improved accuracy and real-time measurement of body temperature bring convenience to people's lives.



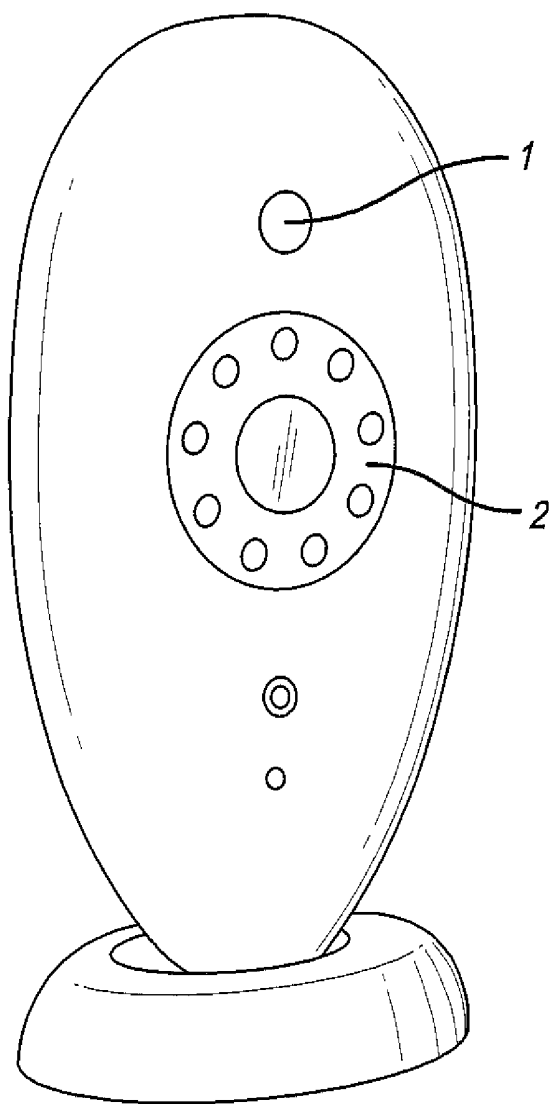


FIG. 1

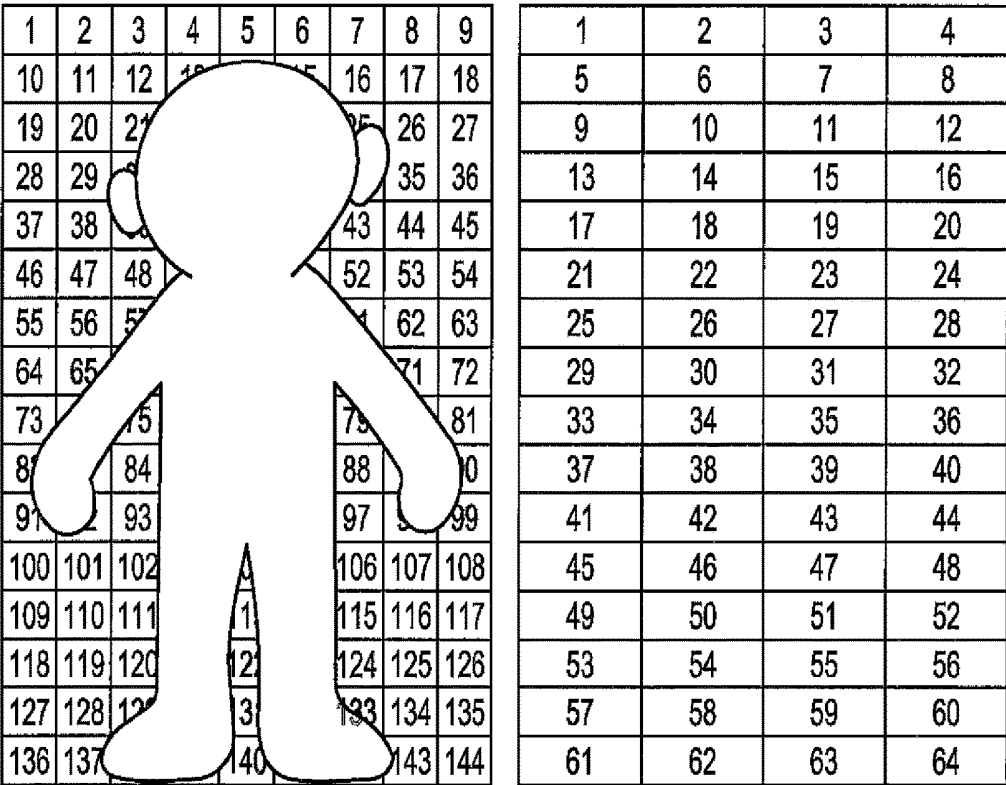
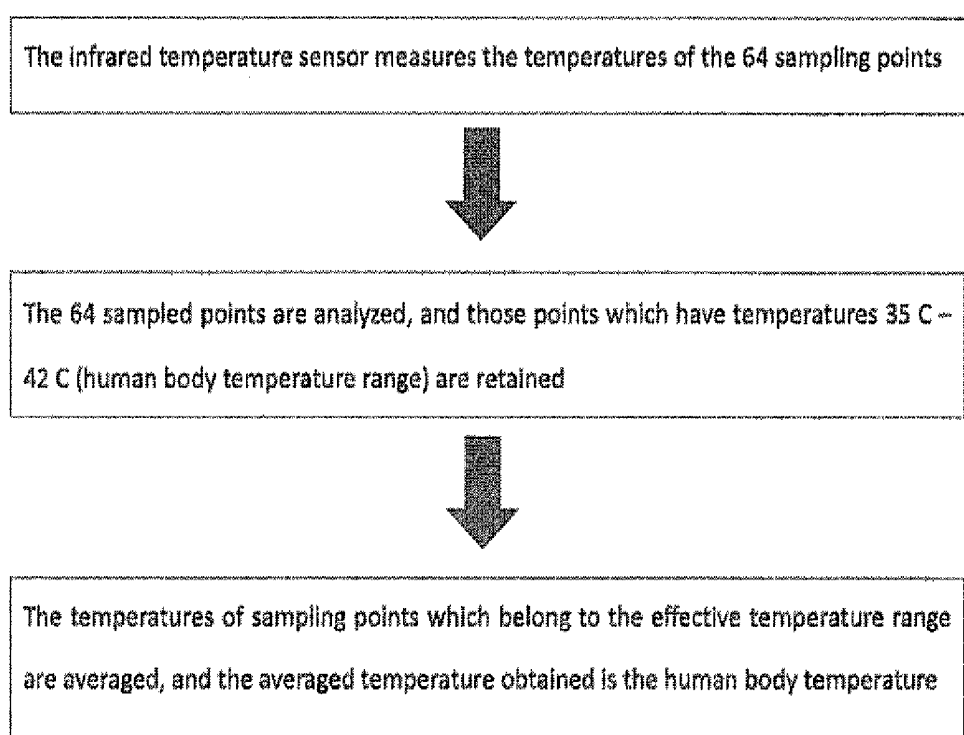


FIG. 2

***FIG. 3***

APPARATUS AND METHOD FOR MEASURING BODY TEMPERATURE OF A HUMAN BODY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority of Chinese Patent Application No. 201610106457.X, filed on Feb. 26, 2016, the entire contents of which are hereby incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention relates to a method for measuring the body temperature of a human body, and more particularly, to an apparatus and method for measuring body temperature of a human body based on a multi-point infrared temperature sensor.

BACKGROUND

[0003] In recent years, with improvements in infrared temperature measurement technology, non-contact infrared thermometers have experienced rapid development, better performance, and continuous improvement. Compared with the contact temperature measurement method, infrared temperature has benefits such as fast response time, is non-contact, may be safer, and others. Infrared detection is a kind of on-line monitoring type high-tech detection technology, which integrates photoelectric imaging technology, computer technology and image processing technology. It receives the infrared ray (infrared radiation) from the object and displays its thermal image on the screen with accuracy and speed.

[0004] With the progress of the times, people's temperature and other parameters of the measurement of life have new requirements not satisfied with the traditional thermometer-based measurement. Infrared temperature measurement based on infrared detection is a new fast, convenient and safe temperature measurement method that can achieve not only non-contact temperature measurement, but also real-time, rapid access to body temperature data. However, the existing infrared temperature measurement device using a single point of measurement, is susceptible to ambient temperature interference, and the error is large. Achieving accurate temperature measurement with infrared technology is a technical problem to be solved urgently.

SUMMARY

[0005] In order to solve the technical problem that the body temperature can not be accurately measured in the prior art, the invention provides an apparatus and method for measuring the body temperature of the human body based on the infrared temperature sensor. This is done by including a high precision infrared temperature sensor in the camera, and eliminating the sampling temperature which is obviously not within the human body temperature range. The remaining sampled effective temperatures are averaged to obtain more accurate temperature data, which greatly reduces the interference of the ambient temperature and realizes real-time, fast, non-contact body temperature measurement.

[0006] The technical proposal of the present invention for solving the above technical problems is as follows:

[0007] An apparatus for measuring the human body temperature. It comprises of an infrared temperature sensor for performing temperature sampling on a plurality $M \times N$ of

sampling points, $M \geq 3$, $N \geq 3$. The temperatures of the sampling points with temperatures within the effective temperature range of the human body are averaged to obtain the body temperature of the human body.

[0008] Further, the effective body temperature interval is 35°C. to 42°C.

[0009] In addition, the invention also provides a method for measuring body temperature of a human body, comprising the following steps:

[0010] 1) the use of infrared temperature sensor to measure the temperature of a sampling point;

[0011] 2) determine whether the temperature of each sampling point falls into the effective human body temperature range;

[0012] 3) calculating the average value of the temperature falling into the effective body temperature range, namely, the human body temperature.

[0013] Further, the effective body temperature range is 35°C. to 42°C.

[0014] Compared with the prior art, the invention effectively avoids the errors that measurement of single point may produce (as may be caused by factors such as the environment); by screening for temperatures within the effective temperature range of the human body, the invention effectively avoids errors or interference produced by factors such as clothing or the environment. The improved accuracy and real-time measurement of body temperature bring convenience to people's lives.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. 1 is a schematic view of a body temperature measuring apparatus of the present invention;

[0016] FIG. 2 is a schematic representation of the temperature sampling of the infrared temperature sensor of the present invention;

[0017] FIG. 3 is a flow chart of the body temperature measurement of the present invention.

DETAILED DESCRIPTION

[0018] For the purpose of describing the principles and the technical solutions of the present invention, the following description will be made in detail with reference to the accompanying drawings. The examples are illustrative only and are not intended to limit the scope of the invention.

[0019] Normal body temperature is generally 36.1°C. $\sim 37^{\circ}\text{C.}$, lower than the oral temperature by about 0.2°C. $\sim 0.4^{\circ}\text{C.}$, according to the level of fever (oral temperature), can be divided into: low heat: 37.4°C. $\sim 38^{\circ}\text{C.}$; 39°C. to 41°C. ; ultra-high heat: 41°C. or higher; and in the present invention, the effective temperature range of the human body is set to 35°C. to 42°C. , and points are only considered when the collected temperature falls within the above-mentioned effective temperature range. Otherwise, it means that the corresponding sampling points do not belong to the human body area or the human body area is blocked by other objects, resulting in abnormal temperature. By eliminating the above abnormal temperature, the average temperature of the sample obtained can produce more accurate body temperature data, avoiding the errors of single point measurement due to the impact of environmental interference. The above is an explanation of the principle of the present invention, and the following description will be given by way of example.

[0020] FIG. 1 is a schematic diagram of the device for measuring body temperature of the present invention, and a high-precision infrared temperature sensor 1 is arranged above the camera 2. The infrared temperature sensor can collect the temperature of 64 sampling points at the same time, the effective temperature collection distance is more than 1.5 meters. The points are distributed in a matrix, as shown in FIG. 2, 64 sampling points are distributed in the whole imaging area. When the human body is detected in the camera shooting area, the infrared temperature sensor is triggered to carry out the temperature sampling, and the temperature corresponding to the 64 sampling points is obtained. Only some of the sampling points fall within the effective region of the human body. FIG. 3 shows a flow chart of the present invention for measuring body temperature of a human body comprising the steps of:

[0021] S1, the infrared temperature sensor measures the temperatures of the 64 sampling points.

[0022] S2, the 64 temperature data collected is analyzed. Because some of the sampling points are not covered by the human body, or because of object occlusion and other reasons, some of the sampling points of the temperature significantly deviate from the human body temperature range. In calculating the body temperature, abnormal points are removed from the sampling points. If the temperature of the sampling point is not within the effective temperature range of the human body, it is considered that the temperature is not the effective temperature and is not taken into account in the calculation; if the sampling point has temperature $35^{\circ}\text{C.}\sim 42^{\circ}\text{C.}$, then it belongs to the effective temperature.

[0023] S3, the temperatures of sampling points which belong to the effective temperature range are averaged, and the average temperature obtained is the measured body temperature.

[0024] The measured temperature data will be uploaded to the local cloud server in real time. Therefore, no matter where the user is, the user can simply open the browser to the specified page or login account through APP to view real-time camera image and body temperature data, remote

body temperature measurement, and monitoring. Preferably, the invention further comprises a face recognition unit which records the historical temperature data of each measured object and when it is found that the body temperature measured by the same subject has a greater difference than the body temperature measured recently by the history, it will note that there may be physical anomalies and will be timely to alert the user about the noted temperature difference.

[0025] The foregoing description is only a few examples of the present invention and is not intended to be limiting of the present invention. Any modifications, equivalent substitutions, improvements and the like within the spirit and principles of the invention are intended to be embraced by the present invention Protection range.

What is claimed is:

1. An apparatus for measuring the human body temperature. It comprises of an infrared temperature sensor for performing temperature sampling on a plurality $M\times N$ of sampling points, where $M\geq 3$, $N\geq 3$. The temperatures of the sampling points with temperatures within the effective temperature range of the human body are averaged to obtain the body temperature of the human body.

2. An apparatus for measuring body temperature of a human body according to claim 1, wherein said effective body temperature range is 35°C. to 42°C.

3. A method of measuring body temperature of a human being, comprising the steps of:

- 1) the use of infrared temperature sensor to measure the temperature of a sampling point;
- 2) determine whether the temperature of each sampling point falls into the effective human body temperature range;
- 3) calculating the average value of the temperature falling into the effective body temperature range, namely, the human body temperature.

4. The method for measuring body temperature of a human body according to claim 3, wherein the effective body temperature range is 35°C. to 42°C.

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专利名称(译)	用于测量人体体温的装置和方法		
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外部链接	Espacenet USPTO		

摘要(译)

本发明涉及一种用于测量人体温度的装置。它包括红外温度传感器，用于对多个 $M \times N$ 个采样点进行温度采样， $M \geq 3$ ， $N \geq 3$ 。将温度在人体有效温度范围内的采样点的温度取平均值，以获得人体的体温。通过收集被测物体的多个采样点的温度，本发明有效地避免了单点测量可能产生的误差（可能是由环境等因素引起的）；通过筛选人体有效温度范围内的温度，本发明有效地避免了诸如衣服或环境等因素产生的错误或干扰。提高了体温的准确性和实时测量，为人们的生活带来了便利。

