

DESCRIPTION

HUMAN BODY DETECTING DEVICE
AND HUMAN BODY DETECTING METHOD

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TECHNICAL FIELD

The present invention relates to a human body detecting unit and a human body detecting method for processing an image imaged by a camera, thereby to detect a presence of a human body, and notify abnormalities in actions of a human body.

BACKGROUND ART

In recent years, a rate of advanced-aged persons has increased. Especially, cares for solitary advance-aged persons have been socially required, and therefore, a use of a human body detecting device has increased as a life sensor for seeing whether the solitary advanced-aged person lives a daily life in a good health.

As a prior art human body detecting device, there is one called an infrared sensor, which detects differences between extreme infrared radiation energies radiated from backgrounds such as indoor walls, floors, and ceilings or the like, and extreme infrared radiation energies radiated from a human body, so as to output a detection signal. The infrared sensor is mainly utilized for prevention of crimes, and controls of indoor illuminations and a ventilation fan.

In addition, there is another one employing a television camera for prevention of crimes, which reproduces a video signal from the television camera positioned in an area to be monitored on a monitor television in a monitoring place so as to keep a watch on the area to be monitored. Since a human body detecting device employing the television camera enables to see with eyes the area to be monitored as it is, it has an advantage that a direction of the television camera is facilitated.

The above-described prior art human body detecting device has following problems.

At first, an infrared sensor type human body detecting device detects a radiated energy fluctuation amount, i.e., a change in a heat quantity, which results in a difficulty in directing the same to the area to be monitored. Next, it is constructed such that a detection signal is output during a predetermined period when an action of the human body is detected. Therefore, a human body comes to a standstill after detected, and the standstill state continues exceeding the predetermined period, which results in failing to output the detection signal. More particularly, the detection state has come to be in an abnormal state, and therefore, the person in the standstill state cannot be detected.

Further, in a human body detecting device employing the television camera, the area to be monitored can be seen with eyes as it is, which results in a difficulty in adapting the same to a

place where a privacy should be respected.

Further, in order to protect a privacy, it might be considered that a noise is superimposed in a video signal so as to make the video difficult to be seen on a caregiver side, and output the same, however it is impossible to provide a detailed video information to the caregiver when a caregiven person has fallen into the abnormal state.

Further, from a view of a protection of a privacy, as described in Japanese Published Patent No. Hei. 10-234030, it might be considered that an original image imaged by the television camera is transmitted from the caregiven person side to the caregiver side, and when the original image is analyzed on the caregiver side, and a predetermined state can be met, the original image is output on the monitor television provided on the caregiver side. However, in this method, the original image is always transmitted to the caregiver side, which results in that a device provided on the caregiver side can be intentionally altered so as to output the original image on the monitor television, and further, since an analyzing means for the original image is provided to the caregiver, the original image should be regularly transmitted from the caregiven person house to the caregiver house via a public circuit network or the like, which results in requiring a large amount of communication expenses.

The present invention is made to solve the above-described

problems and it is an object to provide a human body detecting device which can be adapted to a place where a privacy is respected, such as a toilet and a bathroom, and can be used as a life sensor for seeing whether a person lives a life in a good health, and can provide more detailed video information to the caregiver at a distant place when detecting abnormalities in the human body.

Disclosure of the invention

In order to realize the above-described objects, according to the present invention (claim 1), a human body detecting device comprising: an imaging unit; a human body detecting unit for detecting a human body from an image signal obtained by the imaging unit; a state judging unit for judging a state of the human body; a normal/warning signal outputting unit for outputting a normal signal or a warning signal dependent on whether the human body is in a normal state or in an abnormal state; said human body detecting device comprising: a field memory for storing the image signal; a second memory for dividing an image data of a human body portion included in the image signal into blocks of a predetermined number of pixels and luminance, to be stored; and a selection means for selectively performing a reading out from the field memory and from the second memory in accordance with a judgement result of the state judging unit; wherein the selection means selects to authorize a reading out from the field memory only when it is judged that

abnormal states are encountered in the human body by the state judging unit.

Thus, when a human body is detected, an image signal in which a human body portion is divided into blocks of a predetermined number of pixels and luminance is output from the second memory. When abnormalities in the human body is detected, an image signal is output from the field memory. Therefore, a reading out from the field memory is authorized so that the image signal is output as a video signal only when abnormal states are encountered in the human body. Accordingly, when a caregiven person normally lives a daily life, a privacy can be secured. When a human body is in an abnormal state such as a case where the caregiven person falls down to come to a standstill, a transmission of a detailed video signal can be performed to the caregiver. Therefore, it is possible to provide a useful information for nursing activities as well as providing an efficient information for confirming whether the provided information is wrong or not. Further, when the caregiven person normally lives a daily life, a video signal is transmitted to the caregiver side once a day or several times a day, whereby it is possible to confirm that the caregiven person can normally live a daily life on the caregiver side, and communication expenses of a public circuit can be sharply reduced.

Further, according to the present invention (claim 2), in the human body detecting device of claim 1, the human body

detecting device comprises: a switch for authorizing a transmission of the image data from the field memory selected by the selection means; and a contact and communication means for contacting the human body to urge the human body to push the switch.

Thus, in response to a call from the caregiver in a caregiving center at a distant place receiving a warning signal notifying abnormalities in the human body, a detailed video signal can be voluntarily transmitted by the caregiver person, whereby a protection of the privacy can be strengthened still more.

Further, according to the present invention (claim 3), a human body detecting method comprising: a step for imaging; a step for detecting a human body from an image signal obtained by the imaging step; a step for judging a state of the human body; a step for outputting a normal signal or a warning signal dependent on whether the human body is in a normal state or in an abnormal state; said human body detecting method comprising: a first step for storing the image signal; a second step for dividing an image data of a human body portion included in the image signal into blocks of a predetermined number of pixels and luminance, to be stored; and a third step for selectively performing a reading out the stored data obtained by the first step and the second step in accordance with the judgement result; and the third step selects

to authorize a reading out the stored data obtained by the first step only when it is judged that abnormal states are encountered by the state judging unit.

Thus, when a human body is detected, an image signal in which a human body portion is blocked into blocks of a predetermined number of pixels and luminance is output from the second memory. When abnormalities in the human body is detected, an image signal is output from the field memory. Therefore, a reading out from the field memory is authorized so as to be output as a video signal only when abnormal states are encountered in the human body. Accordingly, when a caregiven person normally lives a daily life, a privacy can be secured. When a human body is in an abnormal state such as a case where the caregiven person falls down to come to a standstill, a transmission of a detailed video signal can be performed to the caregiver. Therefore, it is possible to provide a useful information for nursing activities as well as providing an efficient information for confirming whether the provided information is wrong or not. Further, when the caregiven person normally lives a daily life, a video signal is transmitted to the caregiver side once a day or several times a day, whereby it is possible to confirm that the caregiven person can normally live a daily life on the caregiver side, and communication expenses of a public circuit can be sharply reduced.

Further, according to the present invention (claim 4), in

the human body detecting method of claim 3, the human body detecting method comprises: a fourth step for authorizing a transmission of the image data obtained by the first step selected by executing the third step; and a fifth step for contacting a person to urge/to execute the fourth step.

Thus, in response to a call from the caregiver in a caregiving center at a distant place receiving a warning signal notifying abnormalities in the human body, a detailed video signal can be voluntarily transmitted by the caregiven person, whereby a protection of the privacy can be strengthened still more.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram illustrating a human body detecting device according to a first embodiment of the present invention.

Figure 2 is a system block diagram illustrating a warning system employing a human body detecting device according to a second embodiment of the present invention.

Figure 3 is a view illustrating a blocked human body according to the first and the second embodiments of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[Embodiment 1]

described with reference to figure 1.

Figure 1 is a block diagram illustrating a human body detecting device according to the first embodiment of the present invention.

In figure 1, reference numeral 2 designates an imaging lens. Numeral 3 designates an imaging unit comprising a CCD (Charged Coupled Device) element for converting an image imaged and formed by the imaging lens 2 to an electrical signal and a video signal processing circuit. Numeral 4 designates an A/D converter for converting an analog signal to a digital signal. Numeral 5 designates a field memory. Numeral 6 designates a human body detecting unit for extracting characteristics of a human body from an image signal, detecting a human body portion, and dividing pixel data of a human body portion into blocks of a predetermined number of pixels and luminance level. Numeral 7 designates a second memory for storing the blocked data. Numeral 8 designates a state judging unit for judging that a human body is in a normal life state or in an abnormal life state from data stored in the second memory 7. Numeral 9 designates a control circuit for judging whether an output of a warning signal should be issued or not in accordance with a signal from the human body detecting unit 6 showing a human body is detected or not and a signal from the state judging unit 8 showing whether a human body is in a normal state or in an abnormal state, outputting a selection signal controlling to switch memories (the field memory

5 or the second memory 7), from which image data should be read out, and outputting an instruction signal to issue an output of a normal signal when the human body is judged to be in the normal state, or outputting an instruction signal to issue a warning signal when the human body is judged to be in the abnormal state. Numeral 10 designates a selection means for alternatively switching in accordance with the selection signal so that a detailed image data is output from the field memory 5 in the abnormal state, or a blocked image data is output from the second memory 7 in the normal state. Numeral 11 designates a D/A converter for converting an image data selected by the selection means 10 to an analog video signal. Numeral 12 designates a normal/warning signal outputting unit for outputting a normal signal or a warning signal to the outside in accordance with the instruction signal output from the control unit 9.

Hereinafter, an operation of the human body detecting device 1 is described with reference to figures 1 and 3.

In figure 1, the imaging lens forms an image of a front view of the imaging lens 2 in the imaging unit 3. The imaging unit 3 converts the formed-image view to an electrical signal as an image signal. The A/D converter 4 converts the image signal output from the imaging unit 3 to a digital data, so as to store the same as an image data in the field memory 5. The image data are successively renewed synchronized with the image signal from the imaging unit 3.

The human body detecting unit 6 transmits without processing the image data in the field memory 5 as it is to the second memory 7, so as to be stored in the second memory 7 when the image data stored in the field memory 5 is analyzed to find that no human body can be detected. Further, when the human body is detected, the human body detecting unit 6 converts and divides a pixel data of the human body portion into blocks of pixel data having uniformed luminance as defining a predetermined pixel number as one block as shown in figure 3, so as to be transmitted and stored in the second memory 7, as well as, notifying to the control unit 9 that a human body is detected. With reference to a human body detecting method from the image data, there is a method for grasping a change in an image so as to extract and detect a shape of a human body from characteristics of the shape of the human body, and methods as described in Japanese Published Patent Application No. Hei. 8-69523 and No. Hei. 9-50529.

The control unit 9 receives a signal notifying that the human body is detected, from the human body detecting unit 6, and outputs an instruction signal instructing to judge a state of the human body to the state judging unit 8. The state judging unit 8 receives the instruction signal to judge the state of the human body from the control unit 9, judges whether the human body is in the normal state or not from the image data of the second memory 7, and returns the result to the control unit 9. In order to judge whether the human body is in the abnormal state or not,

there are a method of judging that the person is in the abnormal state such as being fell down when there are changes in the data of the human body portion in the second memory 7 during a predetermined period, or a method as described in Japanese Published Patent Application No. Hei. 9-50529.

In accordance with the result of judgement as to whether the human body is in the abnormal state or not from the state judging unit 8, the control unit 9 makes the selection means 10 kept connected with the side of the second memory 7 when the human body is not in the abnormal state, i.e., it is in the normal state, while the control unit 9 makes the selection means 10 switched to the side of the field memory 5 when the human body is in the abnormal state, and thereby the image data stored in the respective memories are output to the D/A converter 11. The D/A converter 11 converts the image data that is selected and input to an analog video signal, so that such analog video signal is output to the outside.

Further, also in case where the judgement as to whether the human body is in the abnormal state or not by the state judging unit 8 shows that the human body is in the abnormal state even when the human body is not in the abnormal state, the image data which is not divided into blocks stored in the side of the field memory 5 can be output, whereby, it is possible to confirm a precise state.

In addition, the control unit 9 receives a signal from the

human body detecting unit 6 notifying that the human body is detected which is output, and judges that the person normally lives a daily life when the judgement result as to whether the human body is in the abnormal state or not does not show that it is in the abnormal state, and makes a normal signal from the normal/warning signal output unit 12 showing that the caregiven person normally lives a daily life output. Further, the control unit 9 receives a signal from the human body detecting unit 6 showing that a human body is detected, and judges that the person has fallen into the abnormal state when the judgement result as to whether the human body is in the abnormal state or not shows that the person is in the abnormal state, whereby a warning signal is output from the normal/warning signal output unit 12.

As described above, according to the human body detecting device and the human body detecting method of this first embodiment, the image signal of the caregiven person obtained by the imaging lens is divided into blocks of a predetermined pixel number and luminance, the image data of the human body is detected from the blocked pixel signal, and a state of the detected image data is judged by the state judging unit. When the person is in the normal state, a normal signal is output. When the caregiven person has some abnormalities in the body, a warning signal is output so as to output the blocked image data of the human body. Therefore, it is possible to establish the device in a place where a privacy is respected, such as a toilet

or a bathroom, and appropriately notify the abnormal state in the human body of the care given person to the caregiver. In addition, it is possible to accurately confirm whether the information is wrong or not.

[Embodiment 2]

Next, a second embodiment of the present invention corresponding to claims 2 and 4 of the present invention will be described with reference to figure 2.

Figure 2 is a system block view illustrating a warning system employing a human body detecting device according to the second embodiment of the present invention.

In figure 2, an imaging lens 2, an imaging unit 3, an A/D converter 4, a field memory 5, a human body detecting unit 6, a second memory 7, a state judging unit 8, a selecting means 10, a D/A converter 11, and a normal/warning signal outputting unit 12 in a human body detecting device 21 according to this second embodiment have same structures to those in the human body detecting device 1 according to the first embodiment.

Further, the human body detecting device 21 according to the second embodiment comprises an authorizing switch 23 for authorizing to transmit a detailed video signal when a human body is in an abnormal state, a contact and communication unit 24 for contacting and communicating with a caregiving center at a distant place, a control unit 22, a superimposing/splitting unit 25 for superimposing/splitting a video signal output from the D/A

converter 11, a normal signal or a warning signal output from the normal/warning signal outputting unit 12, and a contact and communication signal provided for contacting or communicating in order to save connected wirings between transmitting devices such as a modem device or the like, for transmitting various signals from the human body detecting device 21 and the human body detecting device 21 according to the second embodiment to the caregiving center 34.

Further, the human body detecting device 21 constructed as described above is connected to a home transmitting device 32 having functions for transmitting to the outside the normal signal notifying the person normally lives a daily life, or the warning signal notifying the person has fallen into an abnormal state, the video signal, the contact and communication signal via a public circuit network 33 to the caregiving center 34 at a distant place, as well as receiving a contact and communication signal from the caregiving center 34.

The caregiving center 34 comprises a transmitting device on a caregiver side for receiving the normal signal notifying the caregiven person normally lives a daily life, or the warning signal notifying the human body has fallen into the abnormal state, the video signal, and the contact and communication signal transmitted via the public circuit network 33, as well as transmitting the contact and communication signal, a contact and communication device 37 for contacting and communicating to a

caregiver person home 31 in the abnormal state, and a monitor television 36.

Hereinafter, an operation of the above-described human body detecting device 21 will be described with referring to figures 2 and 3.

However, explanations of operations of the imaging lens 2, the imaging unit 3, the A/D converter 4, and the field memory 5 are omitted since the operations are the same as described in the first embodiment.

In figure 2, when a human body is detected in the image data in the field memory 5, the human body detecting unit 6, similarly as described in the first embodiment, divides image data of the human body portion into blocks of a predetermined number of pixels as shown in figure 3, converts the same to pixel data having uniformed luminance, and stores the same in the field memory 5, as well as outputting a human body detecting signal to the control unit 22.

The control unit 22, similarly as described in the first embodiment, receives the human body detecting signal, and outputs an instruction signal to judge a state of the human body to the state judging unit 8. The state judging unit 8 receives the instruction signal to judge the state of the human body from the control unit 22, judges whether the human body is not in the abnormal state or not in accordance with the image data from the second memory 7, and returns the result to the control unit 22.

In accordance with the judgement result as to whether the human body is in the abnormal state or not from the state judging unit 8, the control unit 22 judges that the person normally lives a daily life when the judgement result does not show the abnormal state, and outputs a normal signal showing that the caregiven person normally lives a daily life from the normal/warning signal outputting unit 12. At this time, since the selection means 10 selects the second memory 7, the image data in the second memory 7 is converted to a video signal in D/A converter 11 to be input in the superimposing/splitting unit 25. The normal signal and the video signal input in the superimposing/splitting unit 25 are superimposed, output to the outside of the human body detecting device 21, and transmitted to the transmitting device on the caregiver side 35 provided on the caregiving center 34 via the home transmitting device 32 and the public circuit network 33.

The transmitting device on the caregiver side 35 can confirm that the caregiven person normally lives a daily life in accordance with the received normal signal, as well as outputting the video signal on the monitor television 36. Further, with respect to a transmission of the normal signal from the human body detecting device 21, a frequency of confirming that the caregiven person normally lives a daily life can be arbitrarily set, such as once a day, in accordance with a setting of the control unit 21.

Further, when the judgement result as to whether the human

body is in the abnormal state or not from the state judging unit 8 shows the abnormal state, the control unit 22 outputs a warning signal from the normal/warning signal outputting unit 12, as well as starting the contact and communication unit 24. At this time, unlikely as described in the first embodiment, since the selection means 10 is constructed to select not the field memory 5 but the second memory 7, whereby the image data in the second memory 7 are converted to a video signal in the D/A converter 11 so as to be input in the superimposing/splitting unit 25. The warning signal, the video signal, and an audio signal from the contact and communication unit 24 input in the superimposing/splitting unit 25 are superimposed, output to the outside of the human body detecting device 21, and transmitted to the transmitting device on the caregiver side 35 provided on the caregiving center 34 via the home transmitting device 32 and the public circuit network 33.

The transmitting device on the caregiver side 35 recognizes that the caregiven person has some abnormalities in accordance with the received warning signal, and notifies to the caregiver in the caregiving center 34 by a warning sound or the like that the abnormal states are encountered, as well as outputting the video signal on the monitor television 36. Since the video signal is formed from the image data in the second memory 7 provided on the human body detecting device 21, the human body portion of the video output on the monitor television 36 is a

blocked video having a uniformed luminance.

In case where the caregiver wishes to know more detailed state by the video, when the caregiver in the caregiving center 34 calls the caregiven person by the contact and communication device 37, the audio signal reaches to the contact and communication unit 24 provided on the human body detecting device 21 via the transmitting device on the caregiver side 35, the public circuit network 33, and the home transmitting device 32. And then, the same is output as a sound, and transmitted to the caregiven person, thereby enabling a conversation. Therefore, the caregiver asks the caregiven person to push the authorizing switch 23.

When the caregiven person pushes the authorizing switch 23, the control unit 22 detects that the authorizing switch 23 is switched, and switches the selection means 10 so as to select the field memory 5. As a result, the image data stored in the selected field memory 5 are converted to a video signal in the D/A converter 11, to be input in the superimposing/splitting unit 25. The video signal is superimposed together with the warning signal and the audio signal in the superimposing/splitting unit 25, and output to the outside of the human body detecting device 21, and input in the transmitting device on the caregiver side 35 via the home transmitting device 32 and the public circuit network 33, so that the transmitting device on the caregiver side 35 outputs the video signal on the monitor television 36. Since

the video signal output on the monitor television 36 is formed from the image data stored in the field memory 35 provided on the human body detecting device 21. Therefore, it is a detailed video signal imaged by the imaging unit 3, and it is easier to be understood compared with the blocked image signal formed by the image data in the second memory 7.

The authorizing switch 23 provided on the human body detecting device 21 can employ a wireless pendant-type switch so that the caregiven person can use the same with hanging from the neck, whereby the caregiven person in the abnormal state can easily push the authorizing switch 23. Further, a receiving unit for receiving a wireless signal showing the wireless pendant-type switch is pushed may be provided in the human body detecting device 21.

According to the so-constructed human body detecting device and the human body detecting method according to the second embodiment of the present invention, an image signal of the caregiven person obtained by the imaging lens is divided into blocks of a predetermined number of pixels and luminance, the image data of the human body is detected from the blocked pixel signal, and a state of the detected image data is judged by the state judging unit. When the caregiven person is in the normal state, a normal signal is output. When the caregiven person has some abnormalities in the human body, a warning signal is output. Further, when the warning signal is output, the blocked image

data of the human body is output. Further, the caregiver communicates with the caregiven person employing the audio signal, and asks the caregiven person to push the authorizing switch for seeing a video showing more detailed state of the caregiven person, whereby it is possible to transmit a video signal having unblocked and detailed video and securely protect a privacy of the caregiven person.

INDUSTRIAL AVAILABILITY

As described above, the human body detecting device and the human body detecting method according to the present invention are useful for realizing a human body detection, in which a privacy of a caregiven person can be respected, and which can be employed as a life sensor, and which can provide more detailed video information to the caregiver at a distant place when abnormalities in the caregiven person are detected.

WHAT IS CLAIMED IS:

1. A human body detecting device comprising:

- an imaging unit;

- a human body detecting unit for detecting a human body from an image signal obtained by the imaging unit;

- a state judging unit for judging a state of the human body;

- a normal/warning signal outputting unit for outputting a normal signal or a warning signal dependent on whether the human body is in a normal state or in an abnormal state;

- said human body detecting device comprising:

- a field memory for storing the image signal;

- a second memory for dividing an image data of a human body portion included in the image signal into blocks of a predetermined number of pixels and luminance, to be stored; and

- a selection means for selectively performing a reading out from the field memory and from the second memory in accordance with a judgement result of the state judging unit; wherein

- the selection means selects to authorize a reading out from the field memory only when it is judged that abnormal states are encountered in the human body by the state judging unit.

2. The human body detecting device of claim 1, wherein the human body detecting device comprises:

- a switch for authorizing a transmission of the image data from the field memory selected by the selection means; and

a contact and communication means for contacting the human body to urge the human body to push the switch.

3. A human body detecting method comprising:

a step for imaging;

a step for detecting a human body from an image signal obtained by the imaging step;

a step for judging a state of the human body;

a step for outputting a normal signal or a warning signal dependent on whether the human body is in a normal state or in an abnormal state;

said human body detecting method comprising:

a first step for storing the image signal;

a second step for dividing an image data of a human body portion included in the image signal into blocks of a predetermined number of pixels and luminance, to be stored; and

a third step for selectively performing a reading out the stored data obtained by the first step and the second step in accordance with the judgement result; wherein

the third step selects to authorize a reading out the stored data obtained by the first step only when it is judged that abnormal states are encountered in the human body by the state judging unit.

4. The human body detecting method of claim 3, wherein the human body detecting method comprises:

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a fourth step for authorizing a transmission of the image data obtained by the first step selected by executing the third step; and

a fifth step for contacting a person to urge to execute the fourth step.