Title: REMOTE CONTROL METHOD AND APPARATUS FOR REMOTE CONTROL MOUSE

Abstract: A remote control method and apparatus using a remote control mouse, wherein the remote control transmits a specific infrared pulse signal to an infrared sensor and image sensor in a receiver of a digital television, set-top box or computer to control the digital television, set-top box or computer, and a central processing unit in the digital television, set-top box or computer analyzes a specific function command from an output signal from the infrared sensor, extracts X and Y coordinate values indicative of a movement amount of an infrared light beam emitted from the remote control mouse, from an output signal from the image sensor and controls the digital television, set-top box or computer on the basis of the analyzed function command and the extracted X and Y coordinate values, thereby remotely controlling a variety of functions of the digital television, set-top box or computer within a free space at a long distance.
REMOTE CONTROL METHOD AND APPARATUS FOR REMOTE CONTROL MOUSE

Technical Field

The present invention relates in general to a remote control method and apparatus for remotely controlling a digital television (TV), set-top box or computer using a remote control mouse, and more particularly to a remote control method and apparatus using a remote control mouse, wherein the remote control mouse transmits a specific infrared pulse signal to an infrared sensor and image sensor in a receiver of a digital TV, set-top box or computer to control the digital TV, set-top box or computer, and a central processing unit (CPU) in the digital TV, set-top box or computer analyzes a specific function command from an output signal from the infrared sensor, extracts coordinate values indicative of a movement amount of an infrared light beam emitted from the remote control mouse, from an output signal from the image sensor and controls the digital TV, set-top box or computer on the basis of the analyzed function command and the extracted coordinate values, thereby remotely controlling a variety of functions of the digital TV, set-top box or computer within a free space at a long distance.

Background Art

It is expected that televisions will be coupled with computers owing to their digitalization and set-top boxes enabling the use of the Internet using the televisions will be widely spread.

Up to the present time, users watch televisions at a certain distance, thereby making it difficult to use wired mice as in computers.

Also, a conventional wireless mouse can be realized by adding a wireless function to a general wired mouse. As a result, a user must move the conventional wireless mouse on a mouse plate (for the wireless mouse) to freely
move a cursor on the screen for screen manipulation. This signifies that the mouse plate must always be provided for the wireless mouse.

In addition, a touch screen has been proposed to allow a user to touch menus displayed on the screen with his or her fingers to select them. With this touch screen, the user can desirably select the menus on the screen, but has to personally touch the screen in close proximity to the screen, resulting in an inconvenience for the user.

Moreover, a conventional remote mouse can be used to select programs displayed on the screen of a monitor. To this end, a user has to move the remote mouse upward, downward, left and right under the condition that a ball mounted to the body of the mouse is brought into close contact with a plane. As a result, the use of the remote mouse requires a planar space, thereby making it difficult to use the remote mouse within a narrow space.

Disclosure of the Invention

Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a remote control method using a remote control mouse, wherein the remote control mouse transmits a specific infrared pulse (protocol) signal, an infrared sensor senses the specific infrared pulse signal transmitted from the remote control mouse, an infrared filter passes only an infrared component (emitted from an infrared light emitting diode in the remote control mouse) of the specific infrared pulse signal transmitted from the remote control mouse and intercepts a visible light component and other undesired light components, an image sensor senses an image signal from an output signal from the infrared filter through a camera lens mounted to the rear part of the infrared filter, and a central processing unit analyzes a specific function command from an output signal from the infrared sensor, extracts X and Y coordinate values indicative of a movement amount of an infrared light beam emitted from the remote control mouse, from an output signal from the image
sensor and executes a variety of functions, such as cursor movement, clicking, zooming, wheeling, camera lens movement, etc., on the basis of the analyzed function command and the extracted X and Y coordinate values, thereby remotely controlling a digital television, set-top box or computer.

It is another object of the present invention to provide a remote control method using a remote control mouse, wherein a central processing unit does not directly process image data from an image sensor, but a hardware logic circuit compresses each pixel-unit data value (one byte) from the image sensor into a one-bit value, discards the compressed bit value if it is 0 and transfers it to the central processing unit if it is 1, thereby significantly simplifying a data processing procedure of the central processing unit and increasing a coordinate (X,Y) analyzing speed thereof so that it can process data even if it is low in performance.

It is yet another object of the present invention to provide a remote control apparatus using a remote control mouse, wherein the remote control mouse emits a light beam (infrared light beam), and a user can remotely control the screen at a long distance from the screen using the remote control mouse, enter characters without a separate keyboard and execute an Internet search and information entry while viewing a digital television.

In accordance with one aspect of the present invention, in a digital display unit for controlling a screen through a remote control mouse, there is provided a remote control method using the remote control mouse, comprising the steps of a) sensing an infrared pulse signal transmitted from the remote control mouse and generating an interrupt signal by an infrared sensor; b) passing only a specific wavelength component of the infrared pulse signal transmitted from the remote control mouse by an infrared filter installed in the front of a lens of a personal computer camera; and c) analyzing a specific function command from the remote control mouse in response to the interrupt signal from the infrared sensor, extracting X and Y coordinate values indicative of a movement amount of an infrared light beam emitted from the remote control mouse, from an output signal from the infrared filter and executing a mouse control function on the basis of the
analyzed function command and the extracted X and Y coordinate values by a central processing unit.

In accordance with another aspect of the present invention, there is provided a remote control apparatus for a digital display unit, comprising a remote control mouse for remotely controlling a screen of a monitor; a remote signal receiver for receiving an infrared pulse signal transmitted from the remote control mouse and extracting a beam movement amount and a pulse value from the received infrared pulse signal; and an interface containing the remote signal receiver, the interface adapted to display a cursor and the contents of a popped-off menu at a position of the screen corresponding to the extracted movement amount through a first-stage clicking operation of the remote control mouse, analyze the extracted pulse value and output the analyzed result to a main central processing unit in the digital display unit.

Preferably, the remote control mouse may be adapted to transmit the infrared pulse signal to the personal computer camera and the infrared sensor, the personal computer camera including the infrared filter installed in its front part, an image sensor installed in its rear part and the lens installed between the infrared filter and the image sensor, the infrared sensor being disposed separately from the camera.

Further, the above step c) may include the steps of c-1) capturing one frame from the output signal from the infrared filter by the image sensor, the frame being composed of a plurality of pixels arranged vertically and horizontally according to a given resolution; c-2) compressing each pixel-unit one-byte image data of the frame into one-bit data by a hardware logic circuit in such a manner that it is compressed into a true value if it is above a first predetermined reference value and into a false value if it is below the first predetermined reference value; c-3) processing a compressed data string as noise by the hardware logic circuit if it has a successive true data width above or below a second predetermined reference value; and c-4) analyzing the X and Y coordinate values on the basis of compressed normal data by the central processing unit.
Further, the above step c) may include the steps of c-1) determining that the specific function command from the remote control mouse is a wheel button command, in response to the interrupt signal from the infrared sensor; c-2) analyzing a wheel button protocol and activating a wheel button program, if it is determined at the above step c-1) that the specific function command from the remote control mouse is the wheel button command; c-3) turning on the infrared filter and obtaining the X and Y coordinate values from an image sensor; c-4) calculating the movement amount of the infrared light beam emitted from the remote control mouse on the basis of the obtained X and Y coordinate values; and c-5) outputting data based on the calculated movement amount according to a wheel function protocol for a personal computer to execute a wheel button function.

Further, the above step c) may include the steps of c-1) determining that the specific function command from the remote control mouse is a zoom button command, in response to the interrupt signal from the infrared sensor; c-2) analyzing a zoom button protocol and activating a zoom button program, if it is determined at the above step c-1) that the specific function command from the remote control mouse is the zoom button command; c-3) turning on the infrared filter and obtaining the X and Y coordinate values from an image sensor; c-4) analyzing a movement direction of the infrared light beam emitted from the remote control mouse on the basis of the obtained X and Y coordinate values; and c-5) setting an upward or right movement of the infrared light beam to a screen enlargement and a downward or left movement of the infrared light beam to a screen reduction and processing and outputting zoom function data, zoom-in function data and zoom-out function data in accordance with the analyzed movement direction to execute a zoom button function.

Further, the above step c) may include the steps of c-1) determining that the specific function command from the remote control mouse is a focus button command, in response to the interrupt signal from the infrared sensor; c-2) analyzing a focus button protocol and activating a focus button program, if it is
determined at the above step c-1) that the specific function command from the remote control mouse is the focus button command; c-3) turning on the infrared filter and obtaining the X and Y coordinate values from an image sensor; and c-4) driving camera moving means on the basis of the obtained X and Y coordinate values such that X-Xm = 0 and Y-Ym = 0 to move a focus of the personal computer camera to middle coordinates (Xm,Ym), thereby moving the camera focus with movement of the remote control mouse.

Preferably, the camera moving means may include a motor or solenoid mounted to the personal computer camera for adjusting a position of the lens with movement of the remote control mouse.

Further, the remote control mouse may include a keypad having a plurality of keys; a function selection button for selecting a desired program in a program selection menu; and a control button for performing a two-stage clicking operation to execute the program selected by the control button.

Brief Description of the Drawings

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a flowchart illustrating the entire operation of a remote control apparatus using a remote control mouse in accordance with the present invention;

Fig. 2 is a view schematically showing the construction of the remote control apparatus in accordance with the present invention;

Fig. 3a is a flowchart illustrating a coordinate extraction function of the remote control apparatus in accordance with the present invention;

Fig. 3b is a flowchart illustrating an alternative coordinate extraction function of the remote control apparatus in accordance with the present invention;

Fig. 3c is a flowchart illustrating a wheel function of the remote control apparatus in accordance with the present invention;
Fig. 3d is a flowchart illustrating a zooming function of the remote control apparatus in accordance with the present invention;

Fig. 3e is a flowchart illustrating a personal computer screen output function of the remote control apparatus in accordance with the present invention;

Fig. 3f is a flowchart illustrating a television screen output function of the remote control apparatus in accordance with the present invention;

Fig. 3g is a flowchart illustrating system applications of the remote control apparatus in accordance with the present invention;

Fig. 3h is a flowchart illustrating a transmission/reception function of the remote control apparatus in accordance with the present invention;

Fig. 4 is a view illustrating the control of an image sensor depending on the position of the remote control mouse in accordance with the present invention;

Fig. 5 is a view in detail showing the construction of the remote control apparatus in accordance with the present invention;

Fig. 6 is a view showing the construction of a remote signal receiver in Fig. 5;

Fig. 7 is a view illustrating a signal reception procedure using a charge coupled device sensor in accordance with the present invention;

Fig. 8 is a view illustrating a signal reception procedure using a line photo sensor in accordance with the present invention; and

Fig. 9 is a front view of the remote control mouse in accordance with the present invention.

Best Mode for Carrying Out the Invention

Fig. 1 is a flowchart illustrating the entire operation of a remote control apparatus using a remote control mouse in accordance with the present invention, Fig. 2 is a view schematically showing the construction of the remote control apparatus in accordance with the present invention, Figs. 3a to 3h are flowcharts illustrating a variety of functions of the remote control apparatus in accordance
with the present invention and Fig. 4 is a view illustrating the control of an image sensor depending on the position of the remote control mouse in accordance with the present invention.

With reference to Figs. 1 to 4, the remote control apparatus comprises a remote signal receiver including a personal computer (PC) camera 12. The PC camera 12 includes an infrared filter 16 installed in its front part, an image sensor 18 installed in its rear part, and a lens 18a installed between the infrared filter 16 and the image sensor 18. This PC camera 12 is adapted to perform a general PC camera mode at a normal state and a mouse mode when the remote control mouse 10 is operated. The infrared filter 16 is turned off in the PC camera mode and on in the mouse mode.

The remote signal receiver further includes an infrared sensor 14 for sensing an infrared pulse signal transmitted from the remote control mouse 10, and a central processing unit (CPU) interrupted in response to an output signal from the infrared sensor 14. Upon being interrupted, the CPU analyzes a command transmitted from the remote control mouse and turns on the infrared filter 16 (for example, draws it to the front of the lens through a solenoid) installed in the front part of the PC camera 12. When being turned on, the infrared filter 16 passes only a specific wavelength component (emitted from an infrared light emitting diode (LED) in the remote control mouse) of the infrared pulse signal transmitted from the remote control mouse and intercepts a visible light component and other undesired light components. Also, the image sensor 18 senses an image signal from an output signal from the infrared filter 16 and supplies the sensed image signal to the CPU. Then, the CPU extracts X and Y coordinate values indicative of a movement amount of an infrared light beam emitted from the remote control mouse 10, from an output signal from the image sensor 18 and executes a variety of functions on the basis of the analyzed command and the extracted X and Y coordinate values.

The remote control mouse is adapted to transmit a specific infrared pulse signal to the PC camera 12 and the infrared sensor 14, which is installed separately.
from the PC camera 12. As stated above, the infrared filter 16 is installed in the front part of the PC camera 12, the image sensor 18 is installed in the rear part of the PC camera 12, and the lens 18a is installed between the infrared filter 16 and the image sensor 18.

An infrared image extraction method of the present invention will hereinafter be described with reference to Figs. 3a and 3b.

Fig. 3a is a flowchart illustrating a coordinate extraction function of the remote control apparatus in accordance with the present invention.

First, the infrared filter 16 passes only a specific wavelength light beam (infrared light beam) of the infrared pulse signal transmitted from the remote control mouse. Then, the image sensor 18 produces an image corresponding to the light beam passed by the infrared filter 16. The image produced by the image sensor 18 has a plurality of pixels, which are arranged vertically and horizontally according to a given resolution. Each of the pixels of the produced image is typically resolved into one byte (256 steps).

In other words, the infrared filter 16 passes only an infrared light beam transmitted from the remote control mouse and intercepts a visible light component and other undesired light components. Then, the infrared light beam passed by the infrared filter 16 is transmitted to the image sensor 18 through the lens 18a, thereby causing the image sensor 18 to produce an image corresponding to the infrared light beam transmitted from the remote control mouse.

Each pixel value resolved into one byte is converted into a bit value of 1 or 0 on the basis of a predetermined reference value (S10).

For example, a pixel data value of one byte is defined as a 1 if it is above 224 and a 0 if it is below 224. The reference value is set to effectively convert each pixel data value into 1 or 0.

Eight-bit (one-byte) pixel data values are converted into one-bit values and then accumulated on a one byte (eight bits) basis (S11). As a result, the total amount of data can be reduced to 1/8. This is preferably done with a shift register.
Desired data is processed as noise if it has two or less successive true values, or 1s, or seven or more successive true values, and as actual data if it has three or more successive true values or six or less successive true values (S12). As a result, noise is completely removed.

Thereafter, the extracted and compressed data is stored (S13).

Fig. 3b is a flowchart illustrating an alternative coordinate extraction function of the remote control apparatus in accordance with the present invention.

First, specific values are extracted from output data from the image sensor 18 in the above manner (S14). Then, a start point and an end point are extracted from X-pixel values of an image produced by the image sensor 18 (S15) and coordinate values of the extracted start and end points are stored (S16). For example, among one-bit pixel values (000000001111000000), a zero to one rising point is extracted as the start point and a one to zero falling point is extracted as the end point.

An X-middle coordinate value representing a middle point between the stored start and end points is obtained and stored (S17). In this case, all Y-coordinate values between the stored start and end points are stored together with the obtained X-middle coordinate value.

A Y-middle coordinate value is defined as a Y coordinate value crossing X at X = y-1 (S18). This Y-middle coordinate value is extracted from the sequentially increasing ones among the Y-coordinate values stored together with the above X-middle coordinate value. Namely, the Y-middle coordinate value is extracted in consideration of the same object.

The above two methods are performed for the transfer of coordinates after button identification. The respective coordinates must be identified according to buttons of the remote control mouse. For this reason, until a specific button of the remote control mouse is identified, coordinates are not outputted even when they are recognized. When the specific button of the remote control mouse is identified as wheeling, zooming or clicking, corresponding coordinates are outputted.
Fig. 3c is a flowchart illustrating a wheel function of the remote control apparatus in accordance with the present invention.

If the remote control mouse 10 generates a wheel (scroll) button signal, the infrared sensor 14 applies an interrupt signal to the CPU, which then analyzes a wheel (scroll) button protocol and proceeds to a wheel (scroll) button program.

Then, the CPU turns on the infrared filter in the front of the camera (it performs the camera function at the normal state) and obtains X and Y coordinate values indicative of a movement amount of the remote control mouse 10 from the image sensor in the above manner.

The wheel (scroll) function is identified on the basis of the movement amount (a difference between current and previous values) of the remote control mouse 10. In this regard, the movement amount is calculated by comparing the current value with the previous value. The calculated movement amount (upward, downward, left and right on the X and Y coordinates) is outputted according to a wheel function protocol currently used in the PC. As a result, the wheel function is automatically performed in the PC with mouse movement.

Fig. 3d is a flowchart illustrating a zooming function of the remote control apparatus in accordance with the present invention.

If the remote control mouse generates a zoom button signal as in the wheel function, the infrared sensor applies an interrupt signal to the CPU, which then analyzes a zoom button protocol and proceeds to a zoom button program.

Then, the CPU turns on the infrared filter in the front of the camera (it performs the camera function at the normal state) and obtains X and Y coordinate values indicative of a movement amount of the remote control mouse 10 from the image sensor.

Thereafter, the CPU analyzes a movement direction of the remote control mouse 10 on the basis of the obtained X and Y coordinates. The CPU sets the upward (or right) movement of the remote control mouse 10 to a screen enlargement and the downward (or left) movement of the remote control mouse 10 to a screen reduction. In accordance with the analyzed result, the CPU processes
and outputs zoom function data, zoom-in function data and zoom-out function data. Also, the CPU performs the zooming function in the PC. For example, when a user (viewer) cannot properly view a character or picture displayed on the screen, he or she can select the zooming function to enlarge the screen.

Fig. 3e is a flowchart illustrating a personal computer screen output function of the remote control apparatus in accordance with the present invention.

If the user requests graphic data from the CPU in the PC, then the CPU generates the requested graphic data and outputs it to the screen through an output buffer (memory) and a monitor buffer connected thereto.

Fig. 3f is a flowchart illustrating a television screen output function of the remote control apparatus in accordance with the present invention.

Upon receiving data (for example, NTSC (National Television System Committee)) in air waves via an antenna, a TV receiver separates the received data through band passing procedures by channels, controls chrominance and luminance of the separated data and outputs the resulting data to the screen of a Braun tube.

Fig. 3g is a flowchart illustrating system applications of the remote control apparatus in accordance with the present invention.

The CPU controls the generation of memory data for the zooming function and the rearrangement of output data (to the screen).

In other words, the CPU acts to generate memory and output buffer data and rearrange the generated data. The CPU stores the generated data in a buffer (memory) and outputs the stored data to the monitor. At this time, if there is different data to be outputted, the CPU generates a control signal to suspend the output of data stored in the buffer.

On the other hand, if there is no application program, the CPU outputs 1:1 data (data not enlarged) directly to the monitor buffer. However, in the case where an application program is executed, the CPU suspends the data output to the monitor buffer and rearranges data at a ratio based on a rearrangement command.

In a graphic data rearrangement mode, the CPU rearranges output pixels.
at a ratio of 2:1 or 3:1 in response to an enlargement rearrangement command. Then, the CPU stores the rearranged data in the output buffer (memory) for the later output thereof.

Upon determining that the data storage has been completed, the CPU generates a control signal to output the enlarged data to the monitor.

Fig. 3h is a flowchart illustrating a transmission/reception function of the remote control apparatus in accordance with the present invention.

If the user turns on a button of the remote control mouse 10 (S100), then the mouse 10 transmits a function button protocol three times (S101), interrupts the remote signal receiver (S104) and transmits an infrared pulse signal of 35 to 40KHz (S102). Upon being interrupted, the remote signal receiver analyzes the button function (S106), turns on the infrared filter 16 (in this case, the camera function is turned off) and executes a program associated with the analyzed button function (S110). Then, the remote signal receiver receives the infrared pulse signal of 35 to 40KHz transmitted from the remote control mouse 10, extracts coordinate values indicative of a movement amount of the remote control mouse 10 from the received infrared pulse signal (S111), generates data on the basis of the extracted coordinate values (S112) and performs the associated function (S113).

If there is no infrared pulse signal of 35 to 40KHz transmitted from the remote control mouse 10, the remote signal receiver keeps the infrared filter OFF (in this case, the camera function remains ON) (S120) and remains at a button function analysis state.

Fig. 4 is a view illustrating the control of the image sensor depending on the position of the remote control mouse in accordance with the present invention.

When the user uses the remote control mouse 10, the position of the mouse 10 is sensed as X and Y coordinate values by the image sensor 18. It is impossible that the remote control mouse 10 will always be positioned at the center of the lens 18a and that the lens 18a will be changed in position for the use of either the PC camera 12 or remote control mouse 10. In this regard, if the
position of the remote control mouse 10 is extracted as X and Y coordinates, then moving means mounted to the camera, such as motors or solenoids 30 and 32, are used to move the lens 18a so as to position the origin of the X and Y coordinates at the center of the lens 18a. As a result, the lens 18a is always adjusted in position with the movement of the remote control mouse 10, thereby enabling the efficient signal reception and the stable remote control.

For example, assuming that the position of the remote control mouse is 220 at the X axis and 150 at the Y axis and the image sensor is 160 at the X-axis middle and 120 at the Y-axis middle, the CPU outputs a control signal to the X-axis motor to change the X-coordinate value from 220 to 160 and a control signal to the Y-axis motor to change the Y-coordinate value from 150 to 120, thereby adjusting the lens 18a.

Fig. 5 is a view in detail showing the construction of the remote control apparatus in accordance with the present invention, Fig. 6 is a view showing the construction of a remote signal receiver in Fig. 5, Fig. 7 is a view illustrating a signal reception procedure using a charge coupled device (CCD) sensor in accordance with the present invention, Fig. 8 is a view illustrating a signal reception procedure using a line photo sensor in accordance with the present invention, and Fig. 9 is a front view of the remote control mouse in accordance with the present invention.

With reference to Figs. 5 to 9, the remote control apparatus of the present invention comprises a remote control mouse 10 for performing a remote control operation, a remote signal receiver 220 for sensing a position of the remote control mouse 10 applying a remote command, and an interface device 40 including the remote signal receiver 220 and a display unit.

The remote control mouse 10 includes a keypad 212 having a plurality of keys corresponding to characters, symbols, Arabic numerals and their combinations. The remote control mouse 10 further includes a control button 216 for generating a remote control signal to move or fix displayed information, and a function selection button 214 for selecting a desired program in a program
selection menu. The keypad 212, the function selection button 214 and the control button 216 are disposed on the front surface of the body 218 of the remote control mouse 10 such that they are electrically connected to one another. A light emitting diode (LED) lamp 219 is provided at the top of the body 218 to emit a light beam (infrared light beam) corresponding to a set value.

The control button 216 is preferably a two-stage switching button. If the first stage of the control button 216 is pushed, then the LED lamp 219 is turned on to emit an infrared light beam. Then, in the remote signal receiver 220, the infrared light beam emitted from the LED lamp 219 is transmitted to the image sensor through the filter and lens. As a result, the image sensor produces an image corresponding to the transmitted infrared light beam, thereby enabling the operation of the mouse cursor. Then, the CPU moves the cursor to a position sensed by the image sensor and checks whether there is a menu popped off on the screen. If there is a menu popped off on the screen, the CPU pops it up on the screen. If the user moves the remote control mouse 10 upward, downward, left and right, the image produced by the image sensor is thus moved. Then, the cursor moves on the screen in proportion to the movement of the image. A clicking operation is performed by moving the cursor to a desired position and pushing the second stage of the control button 216. A click signal of a specific pulse is generated upon clicking. Namely, upon receiving a light beam (infrared light beam) of a specific pulse under the condition that the cursor does not move, the image sensor recognizes the received light beam not as position data of the cursor, but as a click signal or character data.

It is preferred to put a cover (not shown) on the keypad 212 of the remote control mouse 10 when it is not in use, in order to prevent it from being pushed by mistake.

In the remote signal receiver 220, as shown in Fig. 6, the infrared filter 16 passes (filters) only a desired wavelength component of a light beam (infrared light beam) emitted from the remote control mouse 10, and the passed wavelength component is transmitted to a CCD sensor 28 or a line photo sensor 26 through the
lens 18a, thereby causing the CCD sensor 28 or line photo sensor 26 to produce an image corresponding to the light beam emitted from the remote control mouse 10. Then, the interface recognizes the position (X, Y and Z coordinates) of the image produced by the CCD sensor 28 or line photo sensor 26.

In the case where the CCD sensor 28 is used, if the remote control mouse 10 is horizontally moved from the left position to the right position as shown in Fig. 7, a sensing point of the CCD sensor 28 is moved from X1 to X2. Also, if the remote control mouse 10 is vertically moved from the upper position to the lower position, the sensing point of the CCD sensor 28 is moved from Y1 to Y2. If the remote control mouse 10 is moved from the front position to the rear position, the sensing point of the CCD sensor 28 is moved from Z1 to Z2. A moved point of the remote control mouse 10 can be recognized from the X, Y and Z values detected at the same time.

In the case where the line photo sensor 26 is used, if the remote control mouse 10 is horizontally moved from the left position to the right position as shown in Fig. 8, a sensing point of the line photo sensor 26 is moved from X1 to X2. Also, if the remote control mouse 10 is vertically moved from the upper position to the lower position, the sensing point of the line photo sensor 26 is moved from Y1 to Y2. Similarly, a moved point of the remote control mouse 10 can be recognized from the X and Y values detected at the same time.

The body interface device 40 contains the remote signal receiver 220 in its front part. This interface device 40 acts to receive the position data detected by the remote signal receiver 220 and displays the cursor at the screen position of a monitor 42 corresponding to the received position data.

In the above manner, if the first stage of the control button 216 of the remote control mouse 10 is pushed, then the LED lamp 219 of the mouse 10 is turned on to emit a light beam (infrared light beam). Then, in the remote signal receiver 220, the infrared light beam emitted from the LED lamp 219 is focused on one point (X,Y,Z) of the CCD sensor 28 or line photo sensor 26 through the infrared filter 16, lens 18a and vertical and horizontal spaces. At this time, the
remote control mouse 10 merely moves the light beam of the LED lamp 219 without actually sensing X, Y and Z values and transmitting the sensed values to the computer. Also, the remote control mouse 10 must move the light beam of the LED lamp 219 a greater distance if it is farther from the screen and less if it is closer to the screen. To this end, the remote control mouse 10 varies the X, Y and Z values to X1, Y1 and Z1 using up/down key buttons of the keypad 212, and the body interface device 40 controls variances from X, Y and Z to X1, Y1 and Z1 in a software manner.

While watching a digital television, the user can view a popped-off menu on the screen by merely pushing the first stage of the control button 216 in the remote control mouse 10. If the first stage of the control button 216 is pushed, a popped-off menu or keyboard image is popped up on a portion of the screen such that the user conveniently and simply controls the subsequent operation of the computer through the corresponding function of the remote control mouse 10 as desired. Of course, the reverse operation can be performed to watch the television while using the computer.

Industrial Applicability

As apparent from the above description, the present invention provides a remote control apparatus comprising a remote signal receiver including a personal computer camera. This personal computer camera is adapted to perform a general personal computer camera mode at a normal state and a mouse mode when a remote control mouse is operated. A variety of functions, such as cursor movement, clicking, etc., are performed in the mouse mode. The present remote control apparatus can express even an unseen image by adjusting the screen size. Further, the present remote control apparatus is able to control the screen freely, simply, conveniently and from long distances, enter characters without a separate keyboard and execute an Internet search and information entry while viewing a digital television.

Although the preferred embodiments of the present invention have been
disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.
Claims:

1. In a digital display unit for controlling a screen through a remote control mouse, a remote control method using said remote control mouse, comprising the steps of:
   a) sensing an infrared pulse signal transmitted from said remote control mouse and generating an interrupt signal by an infrared sensor;
   b) passing only a specific wavelength component of the infrared pulse signal transmitted from said remote control mouse by an infrared filter installed in the front of a lens of a personal computer camera; and
   c) analyzing a specific function command from said remote control mouse in response to said interrupt signal from said infrared sensor, extracting X and Y coordinate values indicative of a movement amount of an infrared light beam emitted from said remote control mouse, from an output signal from said infrared filter and executing a mouse control function on the basis of the analyzed function command and the extracted X and Y coordinate values by a central processing unit.

2. The remote control method as set forth in Claim 1, wherein said remote control mouse is adapted to transmit said infrared pulse signal to said personal computer camera and said infrared sensor, said personal computer camera including said infrared filter installed in its front part, an image sensor installed in its rear part and said lens installed between said infrared filter and said image sensor, said infrared sensor being disposed separately from said camera.

3. The remote control method as set forth in Claim 2, wherein said step c) includes the steps of:
   c-1) capturing one frame from the output signal from said infrared filter by said image sensor, said frame being composed of a plurality of pixels arranged vertically and horizontally according to a given resolution;
c-2) compressing each pixel-unit one-byte image data of said frame into one-bit data by a hardware logic circuit in such a manner that it is compressed into a true value if it is above a first predetermined reference value and into a false value if it is below said first predetermined reference value;

5 c-3) processing a compressed data string as noise by said hardware logic circuit if it has a successive true data width above or below a second predetermined reference value; and

c-4) analyzing said X and Y coordinate values on the basis of compressed normal data by said central processing unit.

4. The remote control method as set forth in Claim 1, wherein said step c) includes the steps of:

    c-1) determining that said specific function command from said remote control mouse is a wheel button command, in response to said interrupt signal from said infrared sensor;

15 c-2) analyzing a wheel button protocol and activating a wheel button program, if it is determined at said step c-1) that said specific function command from said remote control mouse is the wheel button command;

    c-3) turning on said infrared filter and obtaining said X and Y coordinate values from an image sensor;

20 c-4) calculating the movement amount of the infrared light beam emitted from said remote control mouse on the basis of the obtained X and Y coordinate values; and

    c-5) outputting data based on the calculated movement amount according to a wheel function protocol for a personal computer to execute a wheel button function.

5. The remote control method as set forth in Claim 1, wherein said step c) includes the steps of:

    c-1) determining that said specific function command from said remote
control mouse is a zoom button command, in response to said interrupt signal from said infrared sensor;

   c-2) analyzing a zoom button protocol and activating a zoom button program, if it is determined at said step c-1) that said specific function command from said remote control mouse is the zoom button command;

   c-3) turning on said infrared filter and obtaining said X and Y coordinate values from an image sensor;

   c-4) analyzing a movement direction of the infrared light beam emitted from said remote control mouse on the basis of the obtained X and Y coordinate values; and

   c-5) setting an upward or right movement of said infrared light beam to a screen enlargement and a downward or left movement of said infrared light beam to a screen reduction and processing and outputting zoom function data, zoom-in function data and zoom-out function data in accordance with the analyzed movement direction to execute a zoom button function.

6. The remote control method as set forth in Claim 1, wherein said step c) includes the steps of:

   c-1) determining that said specific function command from said remote control mouse is a focus button command, in response to said interrupt signal from said infrared sensor;

   c-2) analyzing a focus button protocol and activating a focus button program, if it is determined at said step c-1) that said specific function command from said remote control mouse is the focus button command;

   c-3) turning on said infrared filter and obtaining said X and Y coordinate values from an image sensor; and

   c-4) driving camera moving means on the basis of the obtained X and Y coordinate values such that X-Xm = 0 and Y-Ym = 0 to move a focus of said personal computer camera to middle coordinates (Xm,Ym), thereby moving said camera focus with movement of said remote control mouse.
7. The remote control method as set forth in Claim 6, wherein said camera moving means includes a motor or solenoid mounted to said personal computer camera for adjusting a position of said lens with movement of said remote control mouse.

8. A remote control apparatus for a digital display unit, comprising:
   a remote control mouse for remotely controlling a screen of a monitor;
   a remote signal receiver for receiving an infrared pulse signal transmitted from said remote control mouse and extracting a beam movement amount and a pulse value from the received infrared pulse signal; and
   an interface containing said remote signal receiver, said interface adapted to display a cursor and the contents of a popped-off menu at a position of said screen corresponding to the extracted movement amount through a first-stage clicking operation of said remote control mouse, analyze the extracted pulse value and output the analyzed result to a main central processing unit in said digital display unit.

9. The remote control apparatus as set forth in Claim 8, wherein said remote control mouse includes:
   a keypad having a plurality of keys;
   a function selection button for selecting a desired program in a program selection menu; and
   a control button for performing a two-stage clicking operation to execute the program selected by said control button.
FIG. 3h

transmitter
button ON

transmit function button protocol three times S101

transmit infrared pulse signal of 35 to 40kHz S102

button OFF

receiver
start

interrupted No Yes S104

analyze button function S106

turn On infrared filter (turn Off camera function) S120

execute function program S110

infrared pulse signal of 35 to 40kHz received

Yes S111

extract coordinate values S112

generated data S113

perform function
FIG. 6

CCD sensor reception

line photo sensor reception

remote control mouse interface card
FIG. 7

Left
Right
X-axis movement

Upper
Lower
Y-axis movement

Rear
Front
Z-axis movement
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06F 3/033

According to International Patent Classification (IPC) or to both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06F 3/033

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patent and applications for inventions since 1975
Korean Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
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Further documents are listed in the continuation of Box C. See patent family annex.

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