

REMOTE CONTROL SYSTEM USING AN AUGMENTED IP CAMERA

Field of the Invention

This invention relates to a system for remotely controlling devices. More particularly, this invention relates to using a camera that can be controlled by signals received via a network to control and/or selectively connect the devices to a power supply. Still more particularly, this invention relates to a system that uses a camera connected to a network to selectively connect devices to a power supply.

Prior Art

As networked devices become more common, people would like to be able to remotely control devices using the network. In particular, people would like to be able to remotely switch on and off household appliances. For example, a user may want to switch on lights in their home remotely when the user is not at home or may want to start a feed dispensing system to feed a pet. In the past, most remote systems required the use of server and/or personal computer that is connected to a network, such as the Internet, to execute the appropriate software. However, people often would prefer not to have a home computing system constantly operating and connecting to a network as the operation consumes power and leaves the system vulnerable to cyber-attack. Further, the system often requires that the user understand the use of a complicated user interface. Thus, those skilled in the art are constantly striving to provide alternative remote control system.

Internet Protocol (IP) cameras are well known. IP cameras typically use a wireless Internet connection to provide captured images to a user and allow the user to remotely control the camera. Users prefer these IP cameras as the cameras are easy to use and do not include a complicated interface. However, the processors in IP cameras are often quite small with limited capabilities related to managing the network connection, controlling the camera, and capturing images. Thus, in the past, IP cameras have not been an ideal device for use in a remote control system. Thus, those skilled would like to provide a remote control system that uses a similar interface to provide a remote control system.

Summary of the Invention

The above and other problems are solved and an advance in the art is made by a remote control system in accordance with the present invention. A first advantage of a system in accordance with this invention is that an IP camera may be used to remotely control the power supply to devices in an area using a network connectable device, such

as a laptop, smartphone, or Person Digital Assistant (PDA). A second advantage of a system in accordance with this invention is that the interface for the system is simple and does not require extensive knowledge to use. A third advantage is that only an IP enabled camera needs to remain connected to the network. Thus, unnecessary power is not consumed and the risk of "cyber attack" on home computer systems is reduced.

The above and other advantages are provided by a system configured in the following manner. The system includes a relay including multiple switches, a camera with a connected indicator structure, processing system, and multiple sensors. Each of the switches connects one of the devices to a power supply. The camera is mounted to a mounting structure. The mounting structure has a motor that moves the camera. An indicator structure is connected to the camera and moves with the camera. The processing system is connected to the motor in the mounting structure and the camera; and includes a network transceiver. The processing system is configured to receive signals from a user device via the network transceiver; and generate and transmit signals to the motor. The signal causes the motor to rotate the camera. The sensors are located around the camera.

Each of the sensors is associated with one of the devices. Each sensor includes a status indicator, a timer and a switch signal generator. The status indicator cooperates with the indicator structure connected to the camera to detect and indicate when the camera is aligned with a particular sensor. The timer is connected to the signal indicator and measures a predetermined period of time. In response to the expiration of the predetermined period of time while the camera is aligned to a particular sensor, the timer generates an expiration signal. The switch signal generator is connected to the timer and the switch connecting the device associated with a particular sensor. The switch signal generator generates a toggle signal in response to an expiration signal received from the timer and transmits the toggle signal to connected switch to toggle the switch in response to expiration signal.

In accordance with embodiments of this invention, the processing system is further configured to receive images from the camera and transmit the image to the user device over a network. In accordance with these embodiments, the sensors are positioned about the camera and mounting structure such that only one sensor is shown in a captured image from the camera.

In accordance with some embodiments of this invention, each of the sensor includes a power indicator that indicates whether device associated with the sensor is currently connected to the power supply. In accordance with some of these embodiments the power indicator is a Light Emitting Diode (LED) on the sensor that is connected to the power supply when the switch is in a position that connects the associated device to the power supply. In accordance with particular one of these embodiments, the status indicator also includes an alignment LED and has a different color than the LED for the power indicator and is activated when the camera and sensor are aligned.

In accordance with some embodiments of this invention, the indicator structure connected to the digital camera is a reflector. In accordance with these embodiments, the status indicator of each sensor includes a signal sensor. The signal sensor receives reflected signals responsive to the reflector of the indicator structure being aligned with the signal sensor.

In accordance with other embodiments, the indicator structure is conductive and completes a circuit with the status indicator of a sensor responsive to the status indicator being aligned with indicator structure. In accordance with still other embodiments, the indicator structure includes a signal transmitter and each sensor includes a signal receiver. The signal receiver of a sensor receives signals transmitted from signal transmitter to cause the status indicator of the sensor to indicate that the sensor is aligned with the digital camera.

Brief Description of the Drawings

The above and other features and advantages of this invention are described in the following detailed description and are shown in the following drawings:

Figure 1 illustrating a network including a remote control system in accordance with an embodiment of this invention;

Figure 2 illustrating a digital camera and sensors associated with device in accordance with an embodiment of this invention;

Figure 3 illustrating a block diagram of components of remote control system in accordance with the shown embodiment of this invention;

Figure 4 illustrating a block diagram of components of a processing system in accordance with the shown embodiment of this invention; and

Figure 5 illustrating a flow diagram of process performed by a process system to remotely control devices using the digital camera in accordance with the shown embodiment of this invention.

Detailed Description

This invention relates to a system for remotely controlling devices. More particularly, this invention relates to using a camera that can be controlled by signals received via a network to control the power supply to the devices. Still more particularly, this invention relates to a system that uses a camera connected to a network to selectively connect devices to a power supply. For clarity, components shown in more than one drawing are given the same reference numeral throughout this description.

Figure 1 illustrates network 100 that includes a remote control system in accordance with an embodiment of this invention. The remote control system includes camera 120. Camera 120 is associated with a processing system that includes a wireless transceiver. The wireless transceiver is used by the processing system to communicate with other devices connected to a network. One example of a network is Internet 110. However, those skilled in the art will recognize that the network used in this invention is not limited to the Internet and any type of network with wireless signal capabilities to transmit information may be used to provide this invention. One skilled in the art will also recognize that although the network connection for the camera is a wireless connection in the shown embodiments, other types of connections including, but not limited to, "hard-wired" connections may be used without departing from this invention.

The processing system receives image from camera 120 and transmits the images over wireless connection 115 to another device connected via network 110. The processing system also receives commands from the second device to move the camera and/or adjust setting of the camera. Examples of devices that may communicate with the processing system over network 100, include, but are not limited to, desktop computer system 135, mobile device 140, and laptop computer 145.

Devices 151 -154 are appliances or other electronic devices to be controlled by the remote control system. Devices 151-154 are located in the area proximate camera 120. Each device 151-154 is associated with one of sensors 101 to 104. Sensors 101 to 104 are spaced apart from one another and about camera 120 such that only one sensor 101-104 may be seen in an image captured by the camera at one time. One skilled in the art

will recognize that although 4 devices are shown in the present embodiment, any number of devices may be controlled using a remote control system in accordance with this invention. The placement and operations of sensors 101-104 and camera 120 are discussed with reference to Figure 2.

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Figure 2 illustrates a more detailed view of camera 120 and sensors 101-104 of remote control system 200. In accordance with embodiments of this invention, a conventional IP enabled wireless camera system is used. The IP enable camera includes camera 120 affixed to mounting structure 130. Mounting structure 130 includes a motor (not shown) that is connected to camera 120 to rotate camera 120 in response to user commands received over the wireless network. Indicator structure 125 is a component that is affixed to camera 120 in a manner that allows indicator structure 125 to move and/or rotate in tandem with camera 120. In the shown embodiment, indicator structure 125 is a reflector that reflects signals. In other embodiments, indicator structure 125 may be a conductive pad that cooperates with a second conductive pad to complete a circuit. In still other embodiments, indicator structure 125 may be a transmitter that transmits signals of a specific frequency. One skilled in the art will appreciate that the only requirement of indicator structure 125 is that indicator structure 125 cooperate with a status indicator in each of devices 101-104 to indicate when the camera is align with a particular sensor 101-104. Preferably, indicator structure 125 is aligned with the lens of camera 120. However, other configurations are possible without departing from this invention.

Sensor indicators 171-174 are positioned about camera 120 such that only one sensor indicator 171-174 can be seen in an image captured by camera 120. In the shown embodiment, sensor indicators 171-174 are shown as surrounding camera 120. However, one skilled in the art will recognize other configurations may be used. Furthermore, sensor indicators 171-174 are shown proximate camera 120. However, the precise distance is a design choice that is influenced by the configuration of remote control system 200 in accordance with this invention.

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Each sensor indicator 171-174 includes a power indicator 115 and status indicator 116. Power indicator 115 is a Light Emitting Diode (LED) or other signaling device. Each power indicator 115 is connected to a path connecting the device 151-154 associated with each sensor 101-104 to a power supply. Thus, when power is being supplied to the particular device associated with a particular sensor 101-104, power indicator 115 of that particular sensor 101-104 is activated.

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Status indicator 116 is a LED that indicates when camera 120 is aligned with a particular sensor 101-104. Status indicator 116 is activated when the indicator structure 125 is aligned to one of the sensors 101-104. In the shown embodiment, sensors 101-104 are signal sensors that transmit a signal. The signals transmitted by one of sensors 101-104 are reflected by the reflector of indicator structure 125 when camera 120 is aligned with a particular sensor 101-104. In another embodiment, sensors 101-104 are contact pads that complete a circuit when a contact pad of indicator structure 125 comes into contact with the sensor pad when camera 120 is aligned with a particular sensor 101-104. In another embodiment, sensors 101-104 are receivers that receive signals transmitted from a transmitter in indicator structure 125 when camera 120 is aligned with a particular sensor 101-104. One skilled in the art will note that other configuration of indicators structure 125 and indicator sensors 101-104 may be used without departing from this invention.

Figure 3 illustrates a block diagram of the components of remote control system 200 in accordance with the shown embodiment of this invention. Processing system 210 is communicatively connected to camera 120 and the motor in mounting structure 130 to receive captured images from the camera and change the position of camera 120. In some embodiments, processing system 210 is the processing system that is incorporated into the IP enabled camera system. The processing system and/or instructions stored in software may be modified to allow processing system 200 to work in accordance with this invention. However, it is preferable that no modifications to processing system 200 and/or the instruction are needed to incorporate camera 120 into remote control system 200.

Each device 151-154 controlled by system 200 is connected to power supply 250 through one of switches 216-219 in relay 215. Thus, to control the power supply of one of devices 151-154, each of the sensors 101-104 is connected to one of switches 216-219 that connects the device 151-154 associated with the particular sensor 101-104 to power supply. Each sensor 151-154 may generate and transmit a toggle signal to the associated switch 216-219 to cause the switch to toggle. The toggling of the switch connects or disconnects the particular device 151-154 from power supply 250. As Sensors 101-104 are each connected to one of the switches 216-219, a power indicator 116 in each sensor 101-104 may be activated when the particular switch 216-219 connects the associated device 151-153 to power supply 250 to indicate power is being provided to the device.

Figure 4 illustrates a sensor 400 representing each of sensors 101-104 in accordance with this embodiment of the invention. Sensor 400 includes status indicator 405, timer 410, switch signal generator 415, and power indicator 420. Status indicator 405 is the circuitry in sensor 400 that cooperates with indicator structure 125 to detect alignment of sensor 400 with camera 120. Status indicator 405 may also include an indicator, such as an LED, that is activated when alignment with camera 120 is detected. Timer 410 includes circuitry that times a predetermined period, such as five seconds. During the timing of the period, timer 410 receives signals from indicator 405 indicating alignment of sensor 400 and camera 120. If timer 410 stops receiving signals prior to the expiration of the period, no action is taken. If timer 410 reaches the expiration of the predetermined period while still receiving a signal from indicator 405, timer 410 generates an expiration signal and transmits the expiration signal to switch generator 415. Switch generator 415 includes circuitry that generates a toggle signal in response to receiving the expiration signal from timer 410 and transmits the toggle signal to the switch to cause the switch to change positions. Sensor 400 also includes power indicator circuitry 420 that is also connected to the associated switch to activate an indicator, such as a LED, in response to the switch connecting the power supply to the device.

Figure 5 illustrates process system 500 which is an exemplary processing system 210 including the components needed to execute the applications from instructions stored in memory to provide a remote control system in accordance with the shown embodiment of this invention. One skilled in the art will recognize that the exact configuration of each processing system may be different and the exact configuration for executing processes in accordance with embodiments of this invention will vary from processing system to processing system and this figure is given by way of example only.

Processing system 500 includes Central Processing Unit (CPU) 505. CPU 505 is a processor, microprocessor, or any combination of processors and microprocessors that execute instructions to perform the processes in accordance with the present invention. CPU 505 connects to memory bus 510 and Input/Output (I/O) bus 515. Memory bus 510 connects CPU 505 to memories 520 and 525 to transmit data and instructions between the memories and CPU 505. I/O bus 515 connects CPU 505 to peripheral devices to transmit data between CPU 505 and the peripheral devices. One skilled in the art will recognize that I/O bus 515 and memory bus 510 may be combined into one bus or subdivided into many other busses and the exact configuration is left to those skilled in the art.

A non-volatile memory 520, such as a Read Only Memory (ROM), is connected to memory bus 510. Non-volatile memory 520 stores instructions and data needed to operate various sub-systems of processing system 500 and to boot the system at start-up. One skilled in the art will recognize that any number of types of memory may be used to perform this function.

A volatile memory 525, such as Random Access Memory (RAM), is also connected to memory bus 510. Volatile memory 525 stores the instructions and data needed by CPU 505 to perform software instructions for processes such as the processes for providing a system in accordance with this invention. One skilled in the art will recognize that any number of types of memory may be used to provide volatile memory and the exact type used is left as a design choice to those skilled in the art.

CPU 505 connects to camera 120, motor 521, and a wireless network interface 526 via I/O bus 515. CPU 505 executes instructions from memory to receive images from camera 120 and transmits the received images to user devices using wireless network interface 526. CPU 505 also controls the position of camera 120 by transmitting control signals to motor 521.

Figure 6 illustrates process 600 performed by remote control system 600 to control the power supply to each of devices 151-154 in accordance with the shown embodiment. Process 600 begins in step 605 when processing system 210 receives signals transmitted by a user via the wireless network to move the camera. Processing system 210 generates the proper signals to send to motor 521 to cause camera 120 to be moved according to the signals received in step 610.

In step 615, indicator structure 125 cooperates with one of sensors 101-104 to detect alignment of camera 120. If the indicator structure 125 is not aligned with a sensor 101-104, process 600 is repeated from step 605. If camera 120 and a sensor 101-104 are aligned, the cooperation of indicator structure 125 and one of sensors 101-104 activates the status indicator 116 of the associated indicator sensor 171-174 in step 620.

In step 625, the aligned sensor 101-104 determines whether signals requesting a predefined camera movement are received from the user. In the described embodiment, the predefined camera movement is to hold the camera in the aligned position for a predetermined amount of time, such as 5 seconds. However, a specific movement, such

as rotating the camera 360 degrees or series of movements, such moving the camera up and down may be used without departing from this invention. In these embodiments, a processing system or other additional circuitry may be required to capture and/or analyze the signal transmitted to the motor to move the camera. If the signals for the specific movement are not received, process 600 repeats from step 605. If the signals from the predetermined movement are received in step 625, the aligned sensor 101-104 generates a toggle signal and transmits the toggle signal to the particular switch 216-219 connecting the device 151-154 associated with particular sensor 101-104 that is aligned with camera 120 in step 630.

In response to the switch being toggled, the power indicator 116 on the aligned sensor 101-104 is activated if the power supply is connected to the device and process 600 repeats from step 605. Otherwise, the power indicator 116 is deactivated and process 600 repeats from step 605.

The above is a description of embodiments of a remote control system in accordance with this invention. It is believed other can and will design alternative system that infringe on this invention as set forth in the following claims.

What is claimed is:

1. A system for remotely controlling a plurality of devices comprising:

a plurality of switches wherein each one of said plurality of switches connects one
5 of said plurality of devices to a power supply;

a camera mounted to a mounting structure having a motor wherein said camera is
movable by said motor in said mounting structure;

an indicator structure connected to said camera to move with said camera as said
camera is moved by said motor;

10 a processor that is connected to said motor in said mounting structure and said
camera and includes a network transceiver wherein said processor is configured to:

receive signals from a user device via said network transceiver, and

generate signals and transmit said signals to said motor to cause said motor
to rotate said camera in response to said signals received from said user device;

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a plurality of sensors each associated with one of said plurality of devices and
located about said mounting structure wherein each one of said plurality of sensors
includes:

20 a status indicator that cooperates with said indicator structure to detect and
indicate that said camera is aligned with said one of said plurality of sensors,

a timer connected to said signal indicator that measures a predetermined
period of time and generates a signal in response to an expiration of said
predetermined period of time while said camera is aligned with said one of said
plurality of sensors,

25 a switch signal generator connected to said timer and one of said plurality of
switches connecting one of said plurality of devices associated with said plurality of
sensors wherein said switch signal generator generates a toggle signal in response
to said signal generated by said timer to cause said one of said plurality switches to
toggle.

30 2. The system of claim 1 wherein said plurality of sensors are arranged about said
mounting structure such that an image from said camera may only include one of said
plurality of sensors.

35 3. The system of claim 1 wherein said processor is further configured to:
receive images from said camera; and

transmit said images over a network to said user device using said network transceiver.

4. The system of claim 1 further comprising:

5 a power indicator on each said indicator of each of said plurality of sensors that indicates whether said one of said plurality of switches of said one of said plurality of devices associated with said one of said plurality of sensors currently connects said one of said plurality of devices to said power supply.

10 5. The system of claim 4 wherein said power indicator comprises:

a Light Emitting Diode (LED) on a sensor that is connected to said power supply when said one of said plurality of switches is connecting said one of said plurality of devices associated with said sensor.

15 6. The system of claim 1 wherein said status indicator of each one of said plurality of sensors comprises:

an alignment LED having a different color than said LED of said power indicator that is activated by said camera is aligned with said one of said plurality of sensors.

20 7. The system of claim 1 wherein said indicator structure comprises a reflector and said status indicator of each one of said plurality of sensors includes a signal sensor that receives reflected signal response to said reflector of said indicator structure being aligned with said one of said plurality of sensors.

25 8. The system of claim 1 wherein said indicator structure is conductive and completes a circuit with one of said plurality of sensors responsive to said indicator structure being aligned with said one of said plurality of sensors.

30 9. The system of claim 1 wherein said indicator structure includes a signal transmitter and each one of said plurality of sensors includes a signal receiver that receives signals transmitted from said signal transmitter to cause one of said plurality of said status indicator associated with said one said plurality of sensors to indicate that said one of said plurality of sensors is aligned with said indicator structure in response to receiving said signals.

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10. A method for controlling a plurality of appliances with a camera controlled via signals received over a network comprising:

receiving signals to move said camera;

moving said camera to align with one of a plurality of sensors wherein each of said plurality of sensors is associated with one of said plurality of appliances and is positioned about said camera;

detecting an alignment of said one of said plurality of sensors using a status indicator associated with said one of said plurality of sensors responsive to said camera being aligned with said one of said plurality of sensors;

detecting a predetermined motion of said camera in response to said camera being aligned with said one of said plurality of sensors; and

toggling one of a plurality of switches connecting said one of said plurality of appliances associated with said one of said plurality of sensors to a power supply in response to receiving said signals indicating said predetermined motion.

11. The method of claim 10 wherein said predetermined motion is said camera remaining aligned with said one of said plurality of sensors for a predetermined amount of time.

12. The method of claim 11 wherein said step of activating said status indicator comprises:

aligning a reflector affixed to said camera with a signal detector in said one of said plurality of sensors; and

receiving signals reflected by said reflector in said signal detector.

13. The method of claim 10 wherein said step of activating said status indicator comprises:

receiving a signal from a transmitter affixed to the camera by a receiver on said one of said plurality of sensors responsive to said camera being aligned with said one of said plurality of sensors.

14. The method of claim 10 wherein said step of activating said status indicator comprises:

completing a circuit between said status indicator and a conductor connected to said camera responsive to said camera being aligned with said one of said plurality of sensors.

15. The method of claim 10 further comprising:

activating a power indicator associated with said one of said plurality of sensors responsive to said one of said plurality of switches being toggled to connect said one of said plurality of appliances associated with said one of said plurality of sensors to said power supply.

16. A system for remotely controlling a plurality of devices comprising:

a plurality of switches wherein each of said plurality of switches are connected between one of said plurality of devices and a power supply;

a camera system having a camera mounted to a mounting structure having a motor, and a processing system wherein said processing system is connected to a network, said camera and said motor and is configured to receive signals from a user device over said network and cause said motor to move said camera in response to said received signals,

a plurality of sensors located proximate said camera system wherein each one of said plurality of sensors is associated with one of said plurality of devices;

circuitry configured to detect alignment of said camera with one of said plurality of sensors,

circuitry configured to detect a predetermined motion of said camera in response to a detection of said alignment of said camera with said one of said plurality of sensors; and

circuitry configured to toggle said one of said plurality switches connecting said one of said plurality of devices associated with said one of said plurality of sensors to said power supply in response to a detection of said predetermined motion.

17. The system of claim 16 wherein said predetermined motion is said camera remaining aligned with said one of said plurality of sensors for a predetermined amount of time and said circuitry configured to detect said predetermined motion comprises:

timing circuitry configured to determine when said predetermined amount of time has expired;

circuitry configured to detect said alignment of said camera with said one of said plurality of sensors during said predetermined amount of time;

circuitry configured to generate a signal to toggle said one of said plurality of switches in response to detection of said alignment for said predetermined amount of time.

18. The system of claim 16 further comprising:

circuitry configured to activate a status indicator for said one of said plurality of sensors responsive to said one of said plurality of sensors being aligned with said camera.

19. The system of claim 16 further comprising:

5 circuitry configured to activate a power indicator for one of said plurality of devices responsive to said one of said plurality of devices being connected to said power supply.

20. The system of claim 16 wherein said processing is configured to receive images captured by said camera and transmits said images to a user device via said network.