SECURITY CAMERA HAVING DUAL COMMUNICATION PORTS

TECHNICAL FIELD

[0001] The present disclosure is directed at a security camera having dual communication ports.

BACKGROUND

[0002] The security industry, and in particular the market for internet protocol (IP) security cameras, continues to grow. This is, at least in part, due to the advantages that IP security cameras enjoy over conventional, analog security cameras. For example, IP cameras permit two-way communication, allow for higher resolution than analog cameras, and can easily be relocated on an IP network. Given their increasing popularity, research and development continue into making IP security cameras easier to install and use.

SUMMARY

[0003] According to a first aspect, there is provided a security camera having dual communication ports. The camera comprises a camera body mountable to a mounting surface and comprising an aperture to permit light to enter the camera body; a lens mounted to the camera body and positioned to refract the light entering the camera body through the aperture; an imager located within the camera body and positioned to receive the light refracted by the lens; primary communication circuitry comprising a primary communication port accessible from outside the camera body, wherein the primary communication port is on one side of the mounting surface when the camera body is mounted; secondary communication circuitry comprising a secondary communication port accessible from outside the camera body, wherein the secondary communication port and the aperture are on an opposing side of the mounting surface when the camera body is mounted; and control and processing circuitry communicatively coupled to the imager and to the primary and secondary communication circuitry, the control and processing circuitry comprising a processor and a computer readable medium, communicatively coupled to the processor, having encoded thereon statements and instructions to cause the processor to send a digital communication signal derived

to receive the light refracted by the lens, wherein the primary communication port is on one side of the mounting surface when the camera body is mounted and the secondary communication port and the aperture are on an opposing side of the mounting surface when the camera body is mounted. The method comprising sending a digital communication signal comprising a video signal derived from the light incident on the imager to the secondary communication port when the secondary communication port is coupled to an active link.

[0022] The digital communication signal may be simultaneously sent to both the primary and secondary communication ports. Alternatively, the digital communication signal may be separately sent to the primary communication port or to the secondary communication port.

[0023] The method may further comprise detecting whether the secondary communication port is coupled to the active link, and sending the digital communication signal to the secondary communication port only when the secondary communication port is coupled to the active link.

[0024] Detecting whether the secondary communication port is coupled to the active link may comprise polling the secondary communication port.

[0025] The method may further comprise when the secondary communication port is not coupled to the active link, sending the digital communication signal to the primary communication port.

[0026] The secondary communication port may be located on an underside of the camera body.

[0027] The digital communication signal may be communicated using Ethernet.

[0028] The camera may further comprise a media-independent interface (MII) bus and a primary PHY and a secondary PHY, each of which has outputs connected to the MII bus and via which the digital communication signal is sent to the primary and secondary communication ports, and the method may further comprise: prior to detecting that the secondary communication port is coupled to the active link, sending the digital communication signal to the primary communication port via the primary PHY and setting the outputs of the secondary PHY

Claims:

1. A security camera having dual communication ports, the camera comprising:

(a) a camera body mountable to a mounting surface and comprising an aperture to permit light to enter the camera body;

(b) a lens mounted to the camera body and positioned to refract the light entering the camera body through the aperture;

(c) an imager located within the camera body and positioned to receive the light refracted by the lens;

(d) primary communication circuitry comprising a primary communication port accessible from outside the camera body, wherein the primary communication port is on one side of the mounting surface when the camera body is mounted;

(e) secondary communication circuitry comprising a secondary communication port accessible from outside the camera body, wherein the secondary communication port and the aperture are on an opposing side of the mounting surface when the camera body is mounted; and

(f) control and processing circuitry communicatively coupled to the imager and to the primary and secondary communication circuitry, the control and processing circuitry comprising a processor and a computer readable medium, communicatively coupled to the processor, having encoded thereon statements and instructions to cause the processor to send a digital communication signal derived from the light incident on the imager to the secondary communication port when the secondary communication port is coupled to an active link.

2. The camera of claim 1 wherein the digital communication signal is simultaneously sent to both the primary and secondary communication ports

3. The camera of claim 1 wherein the digital communication signal is separately sent to the primary communication port or to the secondary communication port.

4. The camera of claim 1 wherein the statements and instructions further cause the processor to detect whether the secondary communication port is coupled to the active link, and to send the digital communication signal to the secondary communication port only when the secondary communication port is coupled to the active link.

5. The camera of claim 4 wherein detecting whether the secondary communication port is coupled to the active link comprises polling the secondary communication port

6. The camera of claim 4 wherein the statements and instructions further cause the processor, when the secondary communication port is not coupled to the active link, to send the digital communication signal to the primary communication port.

7. The camera of claim 4 wherein the secondary communication port is located on an underside of the camera body.

8. The camera of claim 4 wherein the digital communication signal is communicated using Ethernet.

9. The camera of claim 4 wherein the control and processing circuitry further comprises a media access controller (MAC) and input/output control circuitry, each of which is communicatively coupled to the processor and to the primary and secondary communication circuitry.

10. The camera of claim 9 wherein the primary communication circuitry comprises a primary PHY communicatively coupled to the primary communication port and to the MAC and the secondary communication circuitry comprises a secondary PHY communicatively coupled to the secondary communication port and to the MAC.

11. The camera of claim 9 wherein the primary and secondary PHYs are communicatively coupled to the MAC through a shared media-independent interface (MII bus) and a shared management data input/out interface (MDIO bus) of the MAC.

12. The camera of claim 11 wherein the primary and secondary PHYs are pin strapped to commence operation by setting their outputs that are connected to the MII bus to a high impedance state.

13. The camera of claim 11 wherein the input/output circuitry comprises a primary reset line communicatively coupled to a reset input of the first PHY, a secondary reset line communicatively coupled to a reset input of the second PHY, and an address line communicatively coupled to an MDIO address select input on the first and second PHYs.

14. The camera of claim 11 wherein the statements and instructions further cause the processor, prior to detecting that the secondary communication port is coupled to the active link, to send the digital communication signal to the primary communication port via the primary PHY and to set outputs of the secondary PHY connected to the MII bus to a high impedance state, and following detecting that the secondary communication port is coupled to the active link:

(a) to stop the primary PHY;

(b) to notify the application layer that there is no active link prior to activating the secondary PHY;

(c) to set outputs of the primary PHY connected to the MII bus to a high impedance state;

(d) to take the outputs of the secondary PHY connected to the MII bus out of a high impedance state;

(e) to activate the secondary PHY; and

(f) to notify the application layer that the active link is present.

15. The camera of claim 1 wherein the camera is a bullet camera.

16. A method for switching between primary and secondary communication ports of a security camera comprising a camera body mountable to a mounting surface, an aperture in the camera body to permit light to enter the camera body, a lens mounted to the camera body and positioned to refract the

light entering the camera body through the aperture, and an imager located within the camera body and positioned to receive the light refracted by the lens, wherein the primary communication port is on one side of the mounting surface when the camera body is mounted and the secondary communication port and the aperture are on an opposing side of the mounting surface when the camera body is mounted, the method comprising sending a digital communication signal comprising a video signal derived from the light incident on the imager to the secondary communication port when the secondary communication port is coupled to an active link.

17. The method of claim 16 wherein the digital communication signal is simultaneously sent to both the primary and secondary communication ports.

18. The method of claim 16 wherein the digital communication signal is separately sent to the primary communication port or to the secondary communication port.

19. The method of claim 16 wherein the method further comprises detecting whether the secondary communication port is coupled to the active link, and sending the digital communication signal to the secondary communication port only when the secondary communication port is coupled to the active link.

20. The method of claim 19 wherein detecting whether the secondary communication port is coupled to the active link comprises polling the secondary communication port.

21. The method of claim 19 wherein the method further comprises when the secondary communication port is not coupled to the active link, sending the digital communication signal to the primary communication port.

22. The method of claim 19 wherein the secondary communication port is located on an underside of the camera body.

23. The method of claim 19 wherein the digital communication signal is communicated using Ethernet.

24. The method of claim 19 wherein the camera further comprises a media-independent interface (MII) bus and a primary PHY and a secondary PHY, each of which has outputs connected to the MII bus and via which the digital communication signal is sent to the primary and secondary communication ports, and further comprising:

(a) prior to detecting that the secondary communication port is coupled to the active link, sending the digital communication signal to the primary communication port via the primary PHY and setting the outputs of the secondary PHY connected to the MII bus to a high impedance state; and

(b) following detecting that the secondary communication port is coupled to the active link:

(i) stopping the primary PHY;

(ii) notifying the application layer that there is no active link prior to activating the secondary PHY;

(iii) setting outputs of the primary PHY connected to the MII bus to a high impedance state;

(iv) taking the outputs of the secondary PHY connected to the MII bus out of a high impedance state;

(v) activating the secondary PHY; and

(vi) notifying the application layer that the active link is present.

25. The method of claim 16 wherein the camera is a bullet camera.

26. A non-transitory computer readable medium having encoded thereon statements and instructions to cause a processor to perform a method as claimed in claim 16.

27. A security camera having dual communication ports, the camera comprising:

(a) a camera body comprising an aperture to permit light to enter the camera body;

(b) a lens mounted to the camera body and positioned to refract the light entering the camera body through the aperture;

(c) an imager located within the camera body and positioned to receive the light refracted by the lens;

(d) an attachment assembly attached to the camera body and mountable to a mounting surface;

(e) primary communication circuitry comprising a primary communication port accessible through the attachment assembly;

(f) secondary communication circuitry comprising a secondary communication port accessible through the camera body; and

(g) control and processing circuitry communicatively coupled to the imager and to the primary and secondary communication circuitry, the control and processing circuitry comprising a processor and a computer readable medium, communicatively coupled to the processor, having encoded thereon statements and instructions to cause the processor to send a digital communication signal derived from the light incident on the imager to the secondary communication port when the secondary communication port is coupled to an active link.

28. The camera of claim 27 wherein the attachment assembly comprises a mounting arm affixed to an attachment plate, and wherein the attachment plate comprises an access port through which the primary communication port is accessible.

29. The camera of claim 28 wherein the access port is positioned on a surface of the attachment plate adjacent to the mounting surface when the camera is mounted.

30. The camera of claim 27 wherein the digital communication signal is simultaneously sent to both the primary and secondary communication ports.

31. The camera of claim 27 wherein the digital communication signal is separately sent to the primary communication port or to the secondary communication port.

32. The camera of claim 27 wherein the statements and instructions further cause the processor to detect whether the secondary communication port is coupled to the active link, and to send the digital communication signal to the secondary communication port only when the secondary communication port is coupled to the active link.

33. The camera of claim 32 wherein detecting whether the secondary communication port is coupled to the active link comprises polling the secondary communication port.

34. The camera of claim 32 wherein the statements and instructions further cause the processor, when the secondary communication port is not coupled to the active link, to send the digital communication signal to the primary communication port.

35. The camera of claim 32 wherein the secondary communication port is located on an underside of the camera body.

36. The camera of claim 32 wherein the digital communication signal is communicated using Ethernet.

37. The camera of claim 32 wherein the control and processing circuitry further comprises a media access controller (MAC) and input/output control circuitry, each of which is communicatively coupled to the processor and to the primary and secondary communication circuitry.

38. The camera of claim 37 wherein the primary communication circuitry comprises a primary PHY communicatively coupled to the primary communication port and to the MAC and the secondary communication circuitry comprises a secondary PHY communicatively coupled to the secondary communication port and to the MAC.

39. The camera of claim 38 wherein the primary and secondary PHYs are communicatively coupled to the MAC through a shared media-independent interface (MII bus) and a shared management data input/out interface (MDIO bus) of the MAC.

40. The camera of claim 39 wherein the primary and secondary PHYs are pin strapped to commence operation by setting their outputs that are connected to the MII bus to a high impedance state.

41. The camera of claim 39 wherein the input/output circuitry comprises a primary reset line communicatively coupled to a reset input of the first PHY, a secondary reset line communicatively coupled to a reset input of the second PHY, and an address line communicatively coupled to an MDIO address select input on the first and second PHYs.

42. The camera of claim 39 wherein the statements and instructions further cause the processor, prior to detecting that the secondary communication port is coupled to the active link, to send the digital communication signal to the primary communication port via the primary PHY and to set outputs of the secondary PHY connected to the MII bus to a high impedance state, and following detecting that the secondary communication port is coupled to the active link:

(a) to stop the primary PHY;

(b) to notify the application layer that there is no active link prior to activating the secondary PHY;

(c) to set outputs of the primary PHY connected to the MII bus to a high impedance state;

(d) to take the outputs of the secondary PHY connected to the MII bus out of a high impedance state;

(e) to activate the secondary PHY; and

(f) to notify the application layer that the active link is present.

43. The camera of claim 27 wherein the camera is a bullet camera.

44. A security camera having dual communication ports, the camera comprising:

(a) a camera body mountable to a mounting surface and comprising an aperture to permit light to enter the camera body;

(b) a lens mounted to the camera body and positioned to refract the light entering the camera body through the aperture;

(c) an imager located within the camera body and positioned to receive the light refracted by the lens;

(d) primary communication circuitry comprising a primary communication port accessible from outside the camera body, wherein the primary communication port is behind the mounting surface when the camera body is mounted;

(e) secondary communication circuitry comprising a secondary communication port accessible from outside the camera body, wherein the secondary communication port is in front of the mounting surface when the camera body is mounted; and

(f) control and processing circuitry communicatively coupled to the imager and to the primary and secondary communication circuitry, the control and processing circuitry comprising a processor and a computer readable medium, communicatively coupled to the processor, having encoded thereon statements and instructions to cause the processor to send a digital communication signal derived from the light incident on the imager to the secondary communication port when the secondary communication port is coupled to an active link.

45. The camera of claim 44 wherein the digital communication signal is simultaneously sent to both the primary and secondary communication ports.

46. The camera of claim 44 wherein the digital communication signal is separately sent to the primary communication port or to the secondary communication port.

47. The camera of claim 44 wherein the statements and instructions further cause the processor to detect whether the secondary communication port is coupled to the active link, and to send the digital communication signal to the secondary communication port only when the secondary communication port is coupled to the active link.

48. The camera of claim 47 wherein detecting whether the secondary communication port is coupled to the active link comprises polling the secondary communication port.

49. The camera of claim 47 wherein the statements and instructions further cause the processor, when the secondary communication port is not coupled to the active link, to send the digital communication signal to the primary communication port.

50. The camera of claim 47 wherein the secondary communication port is located on an underside of the camera body.

51. The camera of claim 47 wherein the digital communication signal is communicated using Ethernet.

52. The camera of claim 47 wherein the control and processing circuitry further comprises a media access controller (MAC) and input/output control circuitry, each of which is communicatively coupled to the processor and to the primary and secondary communication circuitry.

53. The camera of claim 52 wherein the primary communication circuitry comprises a primary PHY communicatively coupled to the primary communication port and to the MAC and the secondary communication circuitry comprises a secondary PHY communicatively coupled to the secondary communication port and to the MAC.

54. The camera of claim 53 wherein the primary and secondary PHYs are communicatively coupled to the MAC through a shared media-independent interface (MII bus) and a shared management data input/out interface (MDIO bus) of the MAC.

55. The camera of claim 54 wherein the primary and secondary PHYs are pin strapped to commence operation by setting their outputs that are connected to the MII bus to a high impedance state.

56. The camera of claim 54 wherein the input/output circuitry comprises a primary reset line communicatively coupled to a reset input of the first PHY, a secondary reset line communicatively coupled to a reset input of the second PHY, and an address line communicatively coupled to an MDIO address select input on the first and second PHYs.

57. The camera of claim 54 wherein the statements and instructions further cause the processor, prior to detecting that the secondary communication port is coupled to the active link, to send the digital communication signal to the primary communication port via the primary PHY and to set outputs of the secondary PHY connected to the MII bus to a high impedance state, and following detecting that the secondary communication port is coupled to the active link:

(a) to stop the primary PHY;

(b) to notify the application layer that there is no active link prior to activating the secondary PHY;

(c) to set outputs of the primary PHY connected to the MII bus to a high impedance state;

(d) to take the outputs of the secondary PHY connected to the MII bus out of a high impedance state;

(e) to activate the secondary PHY; and

(f) to notify the application layer that the active link is present.

58. The camera of claim 44 wherein the camera is a bullet camera.