A method and a storage apparatus for switching a data transmission path to transmit data are provided. The storage apparatus comprises a storage element, an interface connector, a connector control interface connected with the storage element and the interface connector, a wireless transmission module, and an apparatus controller connected with the storage element and the wireless transmission module. In the method, the apparatus controller receives a connection request from a remote apparatus by using the wireless transmission module, and accordingly transmits an inquiry message to the remote apparatus to ask whether to establish a wireless data transmission path. When a confirmation message returned from the remote apparatus is received, the apparatus controller closes the connector control interface and establishes a wireless data transmission path to provide the remote apparatus to access the data in the storage element.
FIG. 1

Receive a connection request from a remote apparatus by using the wireless transmission module

Send an inquiry message to the remote apparatus to ask whether to establish a wireless data transmission path

Receive a message returned from the remote apparatus

Close the interface controller and establish the wireless data transmission path to provide the remote apparatus to access data in the storage element

FIG. 2
Receive a connection request from a remote apparatus by using the wireless transmission module

Send an inquiry message to the remote apparatus to ask whether to establish a wireless data transmission path

Receive a message returned from the remote apparatus

Send a control signal to the data switch to interrupt the data connection between the interface controller and the data switch and establish a data connection between the apparatus controller and the data switch

Send a control signal to the power switch to turn off the power supplied to the interface controller through the power switch

Establish the wireless data transmission path with the remote apparatus by using the wireless transmission module, so as to provide the remote apparatus to access data in the storage element

Cancel the connection request for establishing the wireless data transmission path

FIG. 4
Receive a connection signal sent by the interface connector

Send an inquiry message to the remote apparatus by using the wireless transmission module to ask whether to switch the data transmission path

Receive a message returned from the remote apparatus

Send a control signal to the data switch to interrupt the data connection between the interface controller and the data switch, and establish a data connection between the apparatus controller and the data switch

Send a control signal to the power switch to turn off the power supplied to the interface controller through the power switch

Establish the wireless data transmission path with the remote apparatus by using the wireless transmission module, so as to provide the remote apparatus to access data in the storage element

FIG. 5
Receive a connection request from a remote apparatus by using the wireless transmission module

Determine whether the external apparatus has established a wired data transmission path with the storage apparatus by using the interface connector

Determine whether the wired data transmission path is in an idle state or in the idle state over a predetermined time

Send the inquiry message to the remote apparatus by using the wireless transmission module to ask whether to switch the data transmission path

Receive a message returned from the remote apparatus by using the wireless transmission module

Confirmation message

Send a control signal to the data switch to interrupt a connection between the interface controller and the data switch and establish a data connection between the apparatus controller and the data switch

Send a control signal to the power switch to turn off the power supplied to the interface controller through the power switch

Accept the request of the remote apparatus to establish the wireless data transmission path between the storage apparatus and the remote apparatus

Directly establish the wireless data transmission path with the remote apparatus

Close the wired data transmission path and accept a request of the remote apparatus to directly establish the wireless data transmission path with the remote apparatus

Cancel the request for establishing the wireless data transmission path, and maintain the original wired data transmission path

FIG. 6
METHOD AND STORAGE APPARATUS FOR SWITCHING DATA TRANSMISSION PATH TO TRANSMIT DATA

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the priority benefits of U.S. provisional application Ser. No. 61/688,443, filed on Jul. 5, 2012. The entirety of the above-mentioned patent application is hereby incorporated by reference herein and made a part of this specification.

BACKGROUND

[0002] 1. Technical Field

[0003] The invention relates to a data transmission method and a storage apparatus. Particularly, the invention relates to a method and a storage apparatus for switching between a wired and a wireless data transmission path to transmit data.

[0004] 2. Related Art

[0005] Nowadays, portable mobile devices such as smart phones, and tablet PCs are wide-spread. Such an device not only can be installed with application programs to provide diversified functions such as phone call, messaging, e-mail transceiving, and Internet browsing, but a camera built in the device can further provide users with functions of taking photos or videos so as to record life event at anytime and anywhere. Such a device itself is a small multimedia player, which can provide users with functions of recording, playing and sharing multimedia content such as photos, and videos, so as to improve an entertainment property of the device.

[0006] In order to achieve portability and improve endurance of the device, the mobile device generally uses a compact and power-efficient flash memory to serve as a recording media for programs and files. Compared to a large-volume storage space of a conventional hard disk, the flash memory has a small storage space and a high price. Therefore, considering the cost, the general mobile device is usually not configured with a large-volume memory.

[0007] As the application programs and files installed or stored in the device are increased, the limited storage space of the mobile device is insufficient. Therefore, a product of wireless disk has been developed in the market, which not only provides a wired data connection and a large-volume storage space similar to the conventional mobile hard disk, but also has a wireless transmission function and is capable of establishing a wireless data connection with the mobile device to transmit data, so as to expand an applicable storage space of the mobile device.

[0008] However, the present wireless hard disk can only select one of a wired and a wireless connection manner to perform data transmission, and when a user connects an external device to the wireless hard disk through a physical line such as a universal serial bus (USB), the wireless hard disk establishes a wired data connection with the external device to transmit data. When the user unplugs the external device from the wireless device, the wireless hard disk activates a wireless transmission module to facilitate other devices to establish a wireless data connection therewith to transmit data. In this way, as long as an external device is connected to the wireless hard disk through the physical line, other devices at a remote end cannot access the wireless hard disk, and can only wait for the user to unplug the originally connected device.

SUMMARY

[0009] Accordingly, the invention is directed to a method and a storage apparatus for switching a data transmission path to transmit data, which freely switches between a wired and a wireless data transmission path to transmit data.

[0010] The invention provides a method for switching a data transmission path to transmit data, which is adapted to an apparatus controller of a storage apparatus. The storage apparatus includes a storage element, an interface connector, a connector control interface connected with the storage element and the interface connector, a wireless transmission module, and an apparatus controller connected with the storage element and the wireless transmission module. In the method, a connection request is received from a remote apparatus by using the wireless transmission module, and the apparatus controller receives the connection request and accordingly sends a first inquiry message to the remote apparatus by using the wireless transmission module to ask whether to establish a wireless data transmission path. The apparatus controller receives a confirmation message returned from the remote apparatus by using the wireless transmission module, and accordingly closes the connector control interface and establishes the wireless data transmission path to provide the remote apparatus to access data in the storage element. The connector control interface is an interface controller or a control interface in the apparatus controller that simulates an interface controller.

[0011] In an embodiment of the invention, a method for closing the connector control interface includes turning off a power supplied to the connector control interface.

[0012] In an embodiment of the invention, after the step of sending the first inquiry message to the remote apparatus to ask whether to establish the wireless data transmission path, the method further includes determining whether the confirmation message is received within a predetermined time, and cancelling the connection request for establishing the wireless data transmission path when the confirmation message is not received within the predetermined time.

[0013] In an embodiment of the invention, after the step of sending the first inquiry message to the remote apparatus to ask whether to establish the wireless data transmission path, the method further includes receiving a cancel message returned from the remote apparatus, and accordingly cancelling the connection request for establishing the wireless data transmission path.

[0014] In an embodiment of the invention, after the step of establishing the wireless data transmission path to provide the remote apparatus to access data in the storage element, the method further includes determining whether an external apparatus is connected to the interface connector by the apparatus controller, and sending a second inquiry message to the remote apparatus to ask whether to switch a data transmission path when the apparatus controller determines that the external apparatus is connected to the interface connector, wherein the apparatus controller receives the confirmation message returned from the remote apparatus, the apparatus controller activates the connector control interface to establish a wired data transmission path and interrupt the wireless data transmission path.

[0015] In an embodiment of the invention, the step of interrupting the wireless data transmission path includes disconnecting a connection between the apparatus controller and the storage element to interrupt the wireless data transmission path, or disconnecting a connection between a wireless signal
control interface of the apparatus controller and the storage element to interrupt the wireless data transmission path.

[0016] In an embodiment of the invention, after the step of sending the second inquiry message to the remote apparatus to ask whether to switch the data transmission path, the method further includes determining whether the confirmation message is received within the predetermined time, and cancelling establishment of the wired data transmission path.

[0017] In an embodiment of the invention, after the step of sending the second inquiry message to the remote apparatus to ask whether to switch the data transmission path, the method further includes receiving a cancel message returned from the remote apparatus, so as to cancel establishment of the wired data transmission path.

[0018] In an embodiment of the invention, after the step of receiving the connection request from the remote apparatus by using the wireless transmission module, the method further includes following steps. The apparatus controller receives the connection request and determines whether an external apparatus is connected to a wired data transmission path established by the interface connector. When the apparatus controller determines that none wired data transmission path exists between the storage apparatus and the external apparatus, the apparatus controller directly accepts the connection request and establishes the wireless data transmission path and meanwhile closes the connector control interface to close the wired path. When the apparatus controller determines that the wired data transmission path exists between the storage apparatus and the external apparatus, the apparatus controller determines whether the wired data transmission path is in an idle state. When the apparatus controller determines that the wired data transmission path is in the idle state, the apparatus controller directly accepts the connection request and establishes the wireless data transmission path and meanwhile closes the connector control interface to close the wired path. When the apparatus controller determines that the wired data transmission path is not in the idle state, the apparatus controller sends the first inquiry message to the remote apparatus by using the wireless transmission module, so as to ask whether to establish the wireless data transmission path.

[0019] In an embodiment of the invention, the step of determining whether the wired data transmission path is in the idle state by the apparatus controller further includes following steps. The apparatus controller determines whether the wired data transmission path is in the idle state over a predetermined time, and when a time of the idle state is greater than the predetermined time, the apparatus controller directly accepts the connection request and establishes the wireless data transmission path and meanwhile closes the connector control interface to close the wired path.

[0020] The invention provides a storage apparatus including a storage element, an interface connector, a connector control interface connected with the storage element and the interface connector, a wireless transmission module, and an apparatus controller connected with the storage element and the wireless transmission module. The apparatus controller receives a connection request from a remote apparatus by using the wireless transmission module, and accordingly sends a first inquiry message to the remote apparatus to ask whether to establish a wireless data transmission path. When the apparatus controller receives a confirmation message returned from the remote apparatus, the apparatus controller closes the connector control interface and establishes the wireless data transmission path with the remote apparatus by using the wireless transmission module, so as to provide the remote apparatus to access data in the storage element. The connector control interface is an interface controller or a control interface in the apparatus controller that simulates an interface controller.

[0021] In an embodiment of the invention, a method for closing the connector control interface includes turning off a power supplied to the connector control interface.

[0022] In an embodiment of the invention, the apparatus controller further determines whether the confirmation message is received within a predetermined time, and cancels the connection request for establishing the wireless data transmission path when the confirmation message is not received within the predetermined time.

[0023] In an embodiment of the invention, the apparatus controller further receives a cancel message returned from the remote apparatus, so as to cancel the connection request for establishing the wireless data transmission path.

[0024] In an embodiment of the invention, the storage apparatus further includes a power switch, which is coupled to the power, the connector control interface and the apparatus controller, and receives a control signal of the apparatus controller, so as to turn off or turn on the power supplied to the connector control interface.

[0025] In an embodiment of the invention, the storage apparatus further includes a data switch, which is disposed between the connector control interface, the apparatus controller and the storage element, and receives a control signal of the apparatus controller, so as to establish or switch a data connection between the storage element and the connector control interface and the apparatus controller.

[0026] In an embodiment of the invention, the storage apparatus further includes a data switch, which is disposed between the apparatus controller and the storage element, and establishes or switches a data connection between the storage element and the connector control interface and a wireless signal control interface according to a control signal of the apparatus controller. The connector control interface and the wireless signal control interface are all disposed in the apparatus controller.

[0027] In an embodiment of the invention, the interface connector detects whether an external apparatus is connected, and accordingly sends a connection signal to the apparatus controller, and when the apparatus controller receives the connection signal, the apparatus controller further sends a second inquiry message to the remote apparatus to ask whether to switch a data transmission path, and receives the confirmation message returned from the remote apparatus to accordingly turn on the power supplied to the connector control interface, so as to establish a wired data transmission path and interrupts the wireless data transmission path.

[0028] In an embodiment of the invention, the apparatus controller disconnects a connection between the apparatus controller and the storage element to interrupt the wireless data transmission path, or disconnects a connection between a wireless signal control interface of the apparatus controller and the storage element to interrupt the wireless data transmission path.

[0029] In an embodiment of the invention, the apparatus controller further determines whether the confirmation message is received within the predetermined time, and cancels
establishment of the wired data transmission path when the confirmation message is not received within the predetermined time.

[0030] In an embodiment of the invention, the apparatus controller further receives a cancel message returned from the remote apparatus, and accordingly cancels establishment of the wired data transmission path.

[0031] In an embodiment of the invention, the interface connector and the connector control interface support a universal serial bus (USB) standard, and the wireless transmission module supports signal transceiving of a wireless fidelity (Wi-Fi) system, a worldwide interoperability for microwave access (WiMAX) system, and a bluetooth system.

[0032] According to the above descriptions, in the method and the storage apparatus for switching the data transmission path to transmit data of the present invention, when a remote apparatus is connected through a wireless manner, or when an external apparatus is connected through a wired manner, an inquiry message is transmitted to the remote apparatus to provide a user of the remote apparatus to confirm whether or not to switch the data transmission path, so as to achieve an effect of freely switching between the wired data transmission path and the wireless data transmission path to transmit data.

[0033] In order to make the aforementioned and other features and advantages of the invention comprehensible, several exemplary embodiments accompanied with figures are described in detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

[0035] FIG. 1 is a block diagram of a storage apparatus according to an embodiment of the invention.

[0036] FIG. 2 is a flowchart illustrating a method for switching a data transmission path to transmit data according to an embodiment of the invention.

[0037] FIG. 3 is a block diagram of a storage apparatus according to an embodiment of the invention.

[0038] FIG. 4 is a flowchart illustrating a method for switching a data transmission path to transmit data according to an embodiment of the invention.

[0039] FIG. 5 is a flowchart illustrating a method for switching a data transmission path to transmit data according to an embodiment of the invention.

[0040] FIG. 6 is a flowchart illustrating a method for switching a data transmission path to transmit data according to another embodiment of the invention.

DETAILED DESCRIPTION OF DISCLOSED EMBODIMENTS

[0041] In the invention, an apparatus controller and a connector control interface are configured in a storage apparatus to respectively control a wireless data connection and a wired data connection. When a new external apparatus is connected to the storage apparatus through a wired manner or a wireless manner, a current connection state of the storage apparatus can be opportunely notified to a user of the external apparatus, so as to switch between a wired data transmission path and a wireless data transmission path to transmit data, by which flexibility and convenience for the user accessing data in the storage apparatus are improved.

[0042] FIG. 1 is a block diagram of a storage apparatus according to an embodiment of the invention. Referring to FIG. 1, the storage apparatus 10 of the present embodiment is an electronic apparatus such as a hard disk or a memory card that can provide a data storage function. The storage apparatus 10 includes a storage element 11, an interface connector 12, an interface controller 13, a wireless transmission module 14 and an apparatus controller 15, which are respectively described below.

[0043] The storage element 11 is, for example, a fixed or removable random access memory (RAM) of any type, a read-only memory (ROM), a flash memory, a hard disk, other similar devices or a combination of the above devices, which is used for storing data.

[0044] The interface connector 12 and the interface controller 13 are, for example, a connector and a controller supporting interface standards such as universal serial bus (USB) 2.0, USB 3.0, firewire, and thunderbolt. The interface controller 13 is connected to the interface connector 12, and when an external apparatus is connected to the interface connector 12, the interface controller 13 establishes a wired data transmission path between the external apparatus and the storage apparatus 10 to provide the external apparatus to access data in the storage element 11. Along with different product designs, the apparatus controller 15 may simultaneously have a connector control interface simulating the interface controller and a wireless signal control interface used for processing wireless signals, such that the apparatus controller 15 can be directly connected to the interface connector 12 to form a wired data transmission path and can be connected to the wireless transmission module 14 and a remote apparatus through the wireless signal control interface to form a wireless data transmission path, though the invention is not limited thereto.

[0045] The wireless transmission module 14 is, for example, an apparatus supporting signal transceiving of a wireless fidelity (Wi-Fi) system, or an apparatus supporting signal transceiving of a global system for mobile communication (GSM), a personal handy-phone system (PHS), a code division multiple access (CDMA) system, a worldwide interoperability for microwave access (WiMAX) system or Bluetooth, etc., which provides the external apparatus to connect the storage apparatus through a wireless manner, and accordingly establishes the wireless data transmission path between the external apparatus and the storage apparatus 10, so as to provide the external apparatus to access data in the storage element 11. The wireless transmission module 14 can also be connected to an access point (AP) around the storage apparatus 10, and can be further connected to a network through the AP, so as to share the data in the storage element 11.

[0046] The apparatus controller 15 is, for example, a system on a chip (SoC), which is connected to the storage element 11 and the wireless transmission module 14, and receives a connection request from the remote apparatus by using the wireless transmission module 14, so as to establish the wireless data transmission path to transmit data.

[0047] In detail, FIG. 2 is a flowchart illustrating a method for switching a data transmission path to transmit data according to an embodiment of the invention. Referring to FIG. 2, the method of the present embodiment is adapted to
the storage apparatus 10 of FIG. 1, and detailed steps of the method of the present embodiment are described below with reference to various components in the storage apparatus 10 of FIG. 1.

[0048] First, the apparatus controller 15 receives a connection request from a remote apparatus by using the wireless transmission module 14 (step S202), where a user of the remote apparatus may activate an application program preinstalled in the remote apparatus, so as to connect the storage apparatus 10 through the application program. The application program, for example, searches the storage apparatus 10 on the network through Internet or intranet according to an Internet protocol (IP) address preset by the user, and sends the connection request to the wireless transmission module 14 of the storage apparatus 10 to try to establish a wireless connection with the wireless transmission module 14.

[0049] After the wireless transmission module 14 receives the connection request from the remote apparatus, the apparatus controller 15 sends an inquiry message to the remote apparatus by using the wireless transmission module 14 to ask whether to establish a wireless data transmission path (step S204). The inquiry message sent by the apparatus controller 15 is, for example, received by the application program of the remote apparatus, and is displayed on a screen of the remote apparatus to ask the user of the remote apparatus whether to establish the wireless data transmission path. The application program determines whether the user wants to establish the wireless data transmission path according to an operation of the user, and accordingly sends a confirmation message or a cancel message to the storage apparatus 10.

[0050] Finally, the apparatus controller 15 receives a message returned from the remote apparatus through the wireless transmission module 14 (step S206), and determines whether to establish the wireless data transmission path. When the apparatus controller 15 receives the confirmation message returned from the remote apparatus, the apparatus controller 15, for example, closes the interface controller 13 and establishes the wireless data transmission path with the remote apparatus by using the wireless transmission module 14, so as to provide the remote apparatus to access data in the storage element 11 (step S208). A method for closing the interface controller 13 includes turning off a power supplied to the interface controller 13 by the storage apparatus 10. By turning off the interface controller 13, it is ensured that the external apparatus connected to the interface connector 12 and the remote apparatus do not simultaneously write data to the storage element 11 so as to avoid write error and data loss.

[0051] On the other hand, when the apparatus controller 15 receives a cancel message returned from the remote apparatus, the apparatus controller 15 cancels the connection request for establishing the wireless data transmission path, and maintains the original data transmission path (step S210). If the interface connector 12 is originally connected to the external apparatus, the interface controller 13 continues to maintain the wired data transmission path between the external apparatus and the storage apparatus 10, so as to provide the external apparatus to access data in the storage element 11.

[0052] It should be noticed that after sending the inquiry message to the remote apparatus by using the wireless transmission module 14, the apparatus controller 15 counts a time for waiting the message returned from the remote apparatus, and determines whether the confirmation message is received within a predetermined time, and if the confirmation message is not received within the predetermined time, the apparatus controller 15 automatically cancels the connection request for establishing the wireless data transmission path.

[0053] According to the above method, in case that the remote apparatus tries to establish a connection through a wireless manner, the storage apparatus provides the user of the remote apparatus to freely select to establish the wireless data transmission path or maintain the original wired data transmission path, by which flexibility and convenience for the user accessing data in the storage apparatus are improved.

[0054] It should be noticed that after establishing the wireless data transmission path with the remote apparatus, the storage apparatus 10 continually detects whether the local terminal is connected to other apparatuses, so as to opportunistically switch back to the wired data transmission path to transmit data. Another embodiment is provided below for detailed descriptions.

[0055] FIG. 3 is a block diagram of a storage apparatus according to an embodiment of the invention. Referring to FIG. 3, the storage apparatus 30 of the present embodiment is an electronic apparatus such as a hard disk or a memory card that provides a data storage function. The storage apparatus 30 can be connected to an external apparatus 40 through a wired manner or connected to a remote apparatus 50 through a wireless manner. The storage apparatus 30 includes a storage element 31, an interface connector 32, an interface controller 33, a wireless transmission module 34, an apparatus controller 35, a power switch 36 and a data switch 37. Functions of the storage element 31, the interface connector 32, the interface controller 33, the wireless transmission module 34 and the apparatus controller 35 are the same as or similar to those of the storage element 11, the interface connector 12, the interface controller 13, the wireless transmission module 14 and the apparatus controller 15, so that details thereof are not repeated.

[0056] Different from the aforementioned embodiment, in the present embodiment, the apparatus controller 35 is connected to the interface connector 32, and detection pins configured on the interface connector 32 can be used to detect whether the external apparatus 40 is connected to the interface connector 32. Moreover, the apparatus controller 35 is further connected to the power switch 36 and can turn on or off the power supplied to the interface controller 33 through the power switch 36.

[0057] On the other hand, in the present embodiment, the data switch 37 is further disposed between the storage element 31, the interface controller 33 and the apparatus controller 35, and can establish a data connection between the storage element 31 and the interface controller 33 or between the storage element 31 and the apparatus controller 35, or can be switched between the two controllers under control of the apparatus controller 35. The data switch 37 is, for example, connected to the storage element 31, the interface controller 33, and the apparatus controller 35 through a serial advanced technology attachment (SATA) interface and can be switched therebetween, which is not limited by the invention.

[0058] In detail, FIG. 4 is a flowchart illustrating a method for switching a data transmission path to transmit data according to an embodiment of the invention. According to FIG. 4, the method of the present embodiment is adapted to the storage apparatus 30 of FIG. 3, and detailed steps of switching the wired data transmission path to the wireless data transmission path to transmit data are described below with reference to various components in the storage apparatus 30 of FIG. 3.
First, the apparatus controller 35 receives a connection request from the remote apparatus 50 through a network 60 by using the wireless transmission module 34 (step S402), and sends an inquiry message to the remote apparatus 50 through the network 60 to ask the remote apparatus 50 whether to establish a wireless data transmission path (step S404).

Then, the apparatus controller 35 receives a message returned from the remote apparatus 50 through the network 60 by using the wireless transmission module 34 (step S406), and determines whether to establish the wireless data transmission path. When the apparatus controller 35 receives the confirmation message that confirms to establish the wireless data transmission path from the remote apparatus 50, the apparatus controller 35, for example, sends a control signal to the data switch 37 to interrupt the data connection between the interface controller 33 and the data switch 37, and establish a data connection between itself and the data switch 37 (step S408).

Then, the apparatus controller 35 sends a control signal to the power switch 36 to turn off the power supplied to the interface controller 33 through the power switch 36 (step S410), and establishes the wireless data transmission path with the remote apparatus 50 by using the wireless transmission module 34, so as to provide the remote apparatus 50 to access data in the storage element 31 (step S412).

On the other hand, when the apparatus controller 35 receives a cancel message that cancels establishing the wireless data transmission path from the remote apparatus 50, the apparatus controller 35 cancels the connection request for establishing the wireless data transmission path, and maintains the original wired data transmission path (step S414). Similarly, after sending the inquiry message to the remote apparatus 50, the apparatus controller 35 counts a time for waiting the message returned from the remote apparatus 50, and determines whether the confirmation message is received within a predetermined time. If the confirmation message is not received within the predetermined time, the apparatus controller 35 automatically cancels the connection request for establishing the wireless data transmission path.

FIG. 5 is a flowchart illustrating a method for switching a data transmission path to transmit data according to an embodiment of the invention. According to FIG. 5, the method of the present embodiment follows the flow of FIG. 4, and detailed steps of switching the wireless data transmission path to the wired data transmission path to transmit data are described below.

After the storage apparatus 30 establishes the wireless data transmission path with the remote apparatus 50 to transmit data, the storage apparatus 30 still uses the interface controller 33 to detect whether the external apparatus 40 is connected. When the interface controller 33 detects that the external apparatus 40 is connected, the interface controller 33 sends a connection signal to the apparatus controller 35. When the apparatus controller 35 receives the connection signal (step S502), the apparatus controller 35 sends an inquiry message to the remote apparatus 50 by using the wireless transmission module 34 through the network 60 to ask whether to switch the data transmission path (step S504). Similarly, the inquiry message sent by the apparatus controller 35 is, for example, received by the application program of the remote apparatus 50, and is displayed on a screen of the remote apparatus 50 to ask the user of the remote apparatus 50 whether to switch the data transmission path. The application program determines whether the user wants to switch the data transmission path according to an operation of the user, and accordingly sends a confirmation message or a cancel message to the storage apparatus 30.

The apparatus controller 35 receives a message returned from the remote apparatus 50 through the network 60 by using the wireless transmission module 34 (step S506), and determines whether to switch the data transmission path. When the apparatus controller 35 receives the confirmation message returned from the remote apparatus 50, the apparatus controller 35, for example, sends a control signal to the data switch 37 to interrupt the data connection between itself and the data switch 37, and establishes the data connection between the interface controller 33 and the data switch 37 (step S508).

Then, the apparatus controller 35 sends a control signal to the power switch 36 to turn off the power supplied to the interface controller 33 through the power switch 36 (step S510), so as to establish the wired data transmission path between the interface controller 33 and the external apparatus 40 (step S512), and interrupt the wireless data transmission path between itself and the remote apparatus 50.

On the other hand, when the apparatus controller 35 receives a cancel message returned from the remote apparatus 50, the apparatus controller 35 cancels establishment of the wired data transmission path, and maintains the original wireless data transmission path (step S514). Similarly, after sending the inquiry message to the remote apparatus 50, the apparatus controller 35 counts a time for waiting the message returned from the remote apparatus 50, and determines whether the confirmation message is received within a predetermined time. If the confirmation message is not received within the predetermined time, the apparatus controller 35 automatically cancels the establishment of the wired data transmission path.

Along with different product designs, the storage apparatus 30 connects the external apparatus 40 by using the interface connector 32, if the remote apparatus 50 is connected to the wireless transmission module 34 of the storage apparatus 30 through the network 60 in order to establish the wireless data transmission path to transmit data, the apparatus controller 35 first determines whether the wired data transmission path established between the interface connector 32 and the external apparatus 40 is being used to transmit data. If the apparatus controller 35 determines that the wired data transmission path is not being used to transmit data, the apparatus controller 35 does not send the inquiry message to the remote apparatus 50, and the remote apparatus 50 can be directly connected to the wireless transmission module 34 of the storage apparatus 30 through the network 60 to establish the wireless data transmission path to transmit data. If the apparatus controller 35 determines that the wired data transmission path is being used to transmit data, the apparatus controller 35 sends the inquiry message to the remote apparatus 50, and after receiving the confirmation message from the remote apparatus 50, the apparatus controller 35 closes the wired data transmission path according to the confirmation message and meanwhile establishes the wireless data transmission path or cancels the request for establishing the wireless data transmission path. When data transmission performed by using the wireless data transmission path is completed, the apparatus controller 35 automatically closes the wireless data transmission path to re-establish the wired data transmission path between the storage apparatus 30 and the external apparatus 40.
Referring to FIG. 6, FIG. 6 is a flowchart illustrating a method for switching a data transmission path to transmit data according to another embodiment of the invention. The method of the present embodiment is adapted to the storage apparatus 30 of FIG. 3, and detailed steps of switching the wired data transmission path to the wireless data transmission path to transmit data are described below with reference to various components in the storage apparatus 30 of FIG. 3.

When the apparatus controller 35 of the storage apparatus 30 receives a request for establishing a wireless data connection path from the remote apparatus 50 connected to the wireless transmission module 34 of the storage apparatus 30 through the network 60 (step S602), the apparatus controller 35 first determines whether the external apparatus 40 has established the wired data transmission path with the storage apparatus 30 by using the interface connector 32 (step S604). When the apparatus controller 35 determines that the wired data transmission path is not established, the apparatus controller 35 directly establishes the wireless data transmission path with the remote apparatus 50 (step S606) such that data transmission between the storage apparatus 30 and the remote apparatus 50 can be implemented by using the wireless data transmission path. When the apparatus controller 35 determines that the external apparatus 40 has established the wired data transmission path with the storage apparatus 30, the apparatus controller 35 further determines whether the wired data transmission path is in an idle state or in the idle state over a predetermined time (step S608), where the idle state is a state that the wired data transmission path is not used to transmit data. When the apparatus controller 35 determines that the wired data transmission path is in the idle state or in the idle state over the predetermined time, the apparatus controller 35 closes the wired data transmission path with the remote apparatus 50 (S610). When the apparatus controller 35 determines that the wired data transmission path is not in the idle state (i.e., the wired data transmission path being used to transmit data), the apparatus controller 35 sends the inquiry message to the remote apparatus 50 by using the wireless transmission module 34 to ask whether to switch the data transmission path (step S612), where the apparatus controller 35 determines whether the wired data transmission path is in the idle state according to a signal transmitted by the interface controller 33 or a connector control interface in the apparatus controller 35 used for simulating the interface controller. Similarly, the inquiry message sent by the apparatus controller 35 is, for example, received by the application program of the remote apparatus 50, and is displayed on a screen of the remote apparatus 50 to ask the user of the remote apparatus 50 whether to switch the data transmission path. The application program determines whether the user wants to switch the data transmission path according to an operation of the user, and accordingly sends a confirmation message or a cancel message to the storage apparatus 30.

The apparatus controller 35 receives a message returned from the remote apparatus 50 through the network 60 by using the wireless transmission module 34 (step S614), and determines whether to switch the data transmission path. When the apparatus controller 35 receives the confirmation message returned from the remote apparatus 50, the apparatus controller 35, for example, sends a control signal to the data switch 37 to interrupt a connection between the interface controller 33 or the connector control interface simulating the interface controller 33 and the data switch 37, and establish a data connection between the apparatus controller 35 and the data switch 37 (step S616). Then, the apparatus controller 35 sends a control signal to the power switch 36 to turn off the power supplied to the interface controller 33 through the power switch 36 (step S618), so as to interrupt the wired data transmission path, and the apparatus controller 35 accepts the request of the remote apparatus 50 to establish the wireless data transmission path between the storage apparatus 30 and the remote apparatus 50 (step S620). Along with different product designs, after data transmission performed by using the wireless data transmission path is completed or the wireless data transmission path is not used to transmit data for a period of time, the apparatus controller 35 automatically closes the wireless data transmission path to re-establish the wired data transmission path between the storage apparatus 30 and the external apparatus 40.

On the other hand, when the apparatus controller 35 receives a cancel message returned from the remote apparatus 50, the apparatus controller 35 cancels the request for establishing the wireless data transmission path, and maintains the original wired data transmission path (step S622). Similarly, after sending the inquiry message to the remote apparatus 50, the apparatus controller 35 counts a time for waiting the message returned from the remote apparatus 50, and determines whether the confirmation message is received within a predetermined time. If the confirmation message is not received within the predetermined time, the apparatus controller 35 automatically cancels the request for establishing the wireless data transmission path.

In this way, in case that the local terminal is connected with the external apparatus, the storage apparatus can provide the user of the remote apparatus to freely select to establish the wired data transmission path (or the wireless data transmission path), or maintain the original wired data transmission path (or the wired data transmission path), by which flexibility and convenience for the user accessing data in the storage apparatus are improved.

In summary, in the method and the storage apparatus for switching the data transmission path to transmit data, when the remote apparatus is connected through a wireless manner, or when the external apparatus is connected through a wired manner, the inquiry message is transmitted to the remote apparatus to provide the user of the remote apparatus to confirm whether or not to switch the data transmission path, so that it is unnecessary to wait the user to unplug the originally connected external apparatus. In this way, an effect of freely switching between the wired data transmission path and the wireless data transmission path to transmit data is achieved.

It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.

What is claimed is:

1. A method for switching a data transmission path to transmit data, adapted to a storage apparatus, wherein the storage apparatus comprises a storage element, an interface connector, a connector control interface connected with the storage element and the interface connector, a wireless trans-
mission module, and an apparatus controller connected with the storage element and the wireless transmission module, the method comprising:

receiving a connection request from a remote apparatus by using the wireless transmission module;

the apparatus controller receiving the connection request, and sending a first inquiry message to the remote apparatus by using the wireless transmission module to ask whether to establish a wireless data transmission path;

and the apparatus controller receiving a confirmation message returned from the remote apparatus by using the wireless transmission module, and accordingly closing the connector control interface and establishing the wireless data transmission path to provide the remote apparatus to access data in the storage element.

2. The method for switching the data transmission path to transmit data as claimed in claim 1, wherein the connector control interface is an interface controller.

3. The method for switching the data transmission path to transmit data as claimed in claim 1, wherein the connector control interface is a control interface in the apparatus controller that simulates an interface controller.

4. The method for switching the data transmission path to transmit data as claimed in claim 1, wherein a method for closing the connector control interface comprises turning off a power supplied to the connector control interface.

5. The method for switching the data transmission path to transmit data as claimed in claim 1, wherein after the step of sending the first inquiry message to the remote apparatus to ask whether to establish the wireless data transmission path, the method further comprises:

determining whether the confirmation message is received within a predetermined time, and
cancelling the connection request for establishing the wireless data transmission path when the confirmation message is not received within the predetermined time.

6. The method for switching the data transmission path to transmit data as claimed in claim 1, wherein after the step of sending the first inquiry message to the remote apparatus to ask whether to establish the wireless data transmission path, the method further comprises:

receiving a cancel message returned from the remote apparatus, and accordingly cancelling the connection request for establishing the wireless data transmission path.

7. The method for switching the data transmission path to transmit data as claimed in claim 1, wherein after the step of establishing the wireless data transmission path to provide the remote apparatus to access data in the storage element, the method further comprises:

the apparatus controller determining whether an external apparatus is connected to the interface connector;

the apparatus controller sending a second inquiry message to the remote apparatus to ask whether to switch a data transmission path when determining that the external apparatus is connected; and

the apparatus controller activating the connector control interface when receiving the confirmation message returned from the remote apparatus, so as to establish a wired data transmission path and interrupt the wireless data transmission path.

8. The method for switching the data transmission path to transmit data as claimed in claim 7, wherein the step of interrupting the wireless data transmission path comprises:

disconnecting a connection between the apparatus controller and the storage element to interrupt the wireless data transmission path.

9. The method for switching the data transmission path to transmit data as claimed in claim 7, wherein the step of interrupting the wireless data transmission path comprises:

disconnecting a connection between a wireless signal control interface of the apparatus controller and the storage element to interrupt the wireless data transmission path.

10. The method for switching the data transmission path to transmit data as claimed in claim 7, wherein after the step of sending the second inquiry message to the remote apparatus to ask whether to switch the data transmission path, the method further comprises:

determining whether the confirmation message is received within the predetermined time; and
cancelling establishment of the wired data transmission path when the confirmation message is not received within the predetermined time.

11. The method for switching the data transmission path to transmit data as claimed in claim 7, wherein after the step of sending the second inquiry message to the remote apparatus to ask whether to switch the data transmission path, the method further comprises:

receiving a cancel message returned from the remote apparatus, so as to cancel establishment of the wired data transmission path.

12. The method for switching the data transmission path to transmit data as claimed in claim 1, wherein after the step of receiving the connection request from the remote apparatus by using the wireless transmission module, the method further comprises:

the apparatus controller receiving the connection request, and determining whether an external apparatus is connected to a wired data transmission path established by the interface connector;

the apparatus controller directly accepting the connection request, establishing the wireless data transmission path, and closing the connector control interface to close the wired path when determining that none wired data transmission path exists between the storage apparatus and the external apparatus;

the apparatus controller determining whether the wired data transmission path is in an idle state when determining that the wired data transmission path exists between the storage apparatus and the external apparatus;

the apparatus controller directly accepting the connection request, establishing the wireless data transmission path, and closing the connector control interface to close the wired path when determining that the wired data transmission path is in the idle state; and

the apparatus controller sending the first inquiry message to the remote apparatus by using the wireless transmission module, so as to ask whether to establish the wireless data transmission path when determining that the wired data transmission path is not in the idle state.

13. The method for switching the data transmission path to transmit data as claimed in claim 12, wherein the idle state is a state that the wired data transmission path is not used to transmit data.

14. The method for switching the data transmission path to transmit data as claimed in claim 12, wherein the step of the apparatus controller determining whether the wired data transmission path is in the idle state further comprises:
the apparatus controller determining whether the wired data transmission path is in the idle state over a predetermined time; and
the apparatus controller directly accepting the connection request, establishing the wireless data transmission path, and closing the connector control interface to close the wired path when a time of the idle state is greater than the predetermined time.

15. The method for switching the data transmission path to transmit data as claimed in claim 1, wherein the interface connector and the connector control interface support interface standards of universal serial bus (USB), firewire and thunderbolt.

16. The method for switching the data transmission path to transmit data as claimed in claim 1, wherein the wireless transmission module is an apparatus supporting signal transmitting of a wireless fidelity (Wi-Fi) system, a global system for mobile communication (GSM), a personal handy-phone system (PHS), a code division multiple access (CDMA) system, a worldwide interoperability for microwave access (WiMAX) system or bluetooth.

17. A storage apparatus, comprising:
a storage element;
an interface connector;
a connector control interface, connected with the storage element and the interface connector;
a wireless transmission module; and
an apparatus controller, connected with the storage element and the wireless transmission module, and configured to receive a connection request from a remote apparatus by using the wireless transmission module, and accordingly send a first inquiry message to the remote apparatus to ask whether to establish a wireless data transmission path,
wherein when the apparatus controller receives a confirmation message returned from the remote apparatus, the apparatus controller closes the connector control interface and establishes the wireless data transmission path with the remote apparatus by using the wireless transmission module, so as to provide the remote apparatus to access data in the storage element.

18. The storage apparatus as claimed in claim 17, wherein the connector control interface is an interface controller.

19. The storage apparatus as claimed in claim 17, wherein the connector control interface is a control interface in the apparatus controller that simulates an interface controller.

20. The storage apparatus as claimed in claim 17, wherein a method for closing the connector control interface comprises turning off a power supplied to the connector control interface.

21. The storage apparatus as claimed in claim 17, wherein the apparatus controller further determines whether the confirmation message is received within a predetermined time, and cancels the connection request for establishing the wireless data transmission path when the confirmation message is not received within the predetermined time.

22. The storage apparatus as claimed in claim 17, wherein the apparatus controller further receives a cancel message returned from the remote apparatus, so as to cancel the connection request for establishing the wireless data transmission path.

23. The storage apparatus as claimed in claim 17, further comprising:
a power switch, coupled to the power, the connector control interface and the apparatus controller, and configured to receive a control signal of the apparatus controller, so as to turn off or turn on the power supplied to the connector control interface.

24. The storage apparatus as claimed in claim 17, further comprising:
a data switch, disposed between the connector control interface, the apparatus controller and the storage element, and configured to receive a control signal of the apparatus controller, so as to establish or switch a data connection between the storage element and the connector control interface and the apparatus controller.

25. The storage apparatus as claimed in claim 17, further comprising:
a data switch, disposed between the apparatus controller and the storage element, and configured to establish or switch a data connection between the storage element and the connector control interface and a wireless signal control interface according to a control signal of the apparatus controller.

26. The storage apparatus as claimed in claim 25, wherein the connector control interface and the wireless signal control interface are all disposed in the apparatus controller.

27. The storage apparatus as claimed in claim 17, wherein the connector control interface detects whether an external apparatus is connected, and accordingly sends a connection signal to the apparatus controller, and the apparatus controller further sends a second inquiry message to the remote apparatus to ask whether to switch a data transmission path when receiving the connection signal, and receives the confirmation message returned from the remote apparatus to accordingly turn on the power supplied to the connector control interface, so as to establish a wired data transmission path and interrupts the wireless data transmission path.

28. The storage apparatus as claimed in claim 27, wherein the apparatus controller disconnects a connection between the apparatus controller and the storage element to interrupt the wireless data transmission path.

29. The storage apparatus as claimed in claim 27, wherein the apparatus controller disconnects a connection between a wireless signal control interface of the apparatus controller and the storage element to interrupt the wireless data transmission path.

30. The storage apparatus as claimed in claim 27, wherein the apparatus controller further determines whether the confirmation message is received within the predetermined time, and cancels establishment of the wired data transmission path when the confirmation message is not received within the predetermined time.

31. The storage apparatus as claimed in claim 27, wherein the apparatus controller further receives a cancel message returned from the remote apparatus, and accordingly cancels establishment of the wired data transmission path.

32. The storage apparatus as claimed in claim 17, wherein the interface connector and the connector control interface support interface standards of universal serial bus (USB), firewire and thunderbolt.

33. The storage apparatus as claimed in claim 17, wherein the wireless transmission module is an apparatus supporting signal transferring of a wireless fidelity (Wi-Fi) system, a global system for mobile communication (GSM), a personal...
handy-phone system (PHS), a code division multiple access (CDMA) system, a worldwide interoperability for microwave access (WiMAX) system or bluetooth.