

Micro SD CARD ADAPTER DEVICE

This application claims the benefits of the Taiwan Patent Application Serial No. 101111955, filed on April 5, 2012, the subject matter of which is incorporated herein by reference.

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BACKGROUND OF THE INVENTION

1. Field of the Invention

10 【0001】 The present invention relates to a card adapter device, more particularly to a card adapter device, which includes a wireless transmission/reception interface and a processing chip.

2. Description of the Prior Art

15 【0002】 Due to rapid advance in the electronic technology, it is in the trend to produce the electronic devices in compact size. In addition, the advance of wireless network technology, a plurality of electronic devices can transmit signal or data via the wireless network. Under such circumstance, the storage capacity of a memory card needs to be increased in order to accommodate the ever growing amount of data. For instance, a SD (Secure Digital) card
20 utilized in a digital camera, the photographer usually transmits the shot photo (or image data) to his friends or blogs via the network. Alternately, he/she may transmit the image data to the PC (Personal Computer) for future use. It
25 is noted that prior to transmission of the image data via the network, the photographer must stop the shooting operation and the SD card must be connected to the PC (via wire or wireless connection.)

【0003】Moreover, due to development of tablet computers and smart phones (hereinafter will be called portable electronic devices), the presently available storage cards or sticks are not compatible with the portable electronic devices owing to their different specifications and due to relatively compact size of the devices. When one desires to transmit data within a storage card of a portable electronic device (such as iPhone, iPad, Sensation or Galaxy S2 etc) to a smart phone, a card reader is required for coupling the storage card to the computer. Then only, he or she can transmit the data from the storage card into the computer. The user of the portable electronic device is much annoyed by this inconvenient process.

【0004】As it known to those skilled person in the art, according to the prior technology, the storage card can perform a single operation at one time and cannot perform several operation simultaneously. In other words, the storage card cannot capture image and transmit the image data simultaneously. In addition, the presently available storage cards or sticks are not applicable within the portable electronic devices of different specifications, thereby causing inconvenience to the user of the portable electronic device.

SUMMARY OF THE INVENTION

【0005】In the prior art technology, the storage card can only perform a single operation (transmission of image data) and cannot perform several operations simultaneously. The presently available storage cards or sticks are not applicable

within the portable electronic devices of different specifications, thereby causing inconvenience to the user of the portable electronic device.

【 0006 】 Therefore, the main objective of the present invention is to provide a card adapter device, which includes a card slot, a SD interface, a processing chip and a wireless transmission/reception interface. The processing chip further includes a dynamic switch coupled electrically to the card slot and the SD interface, and a processor unit coupled electrically to the dynamic switch in such a manner that a storage card received in the card slot can conduct several operations, such as transmission or reception of data via the wireless network.

【 0007 】 The SD card adapter device of the present invention includes a card slot for receiving a micro SD (Secure Digital) card therein; a normal SD interface for coupling electrically to an electronic device; a processing chip including a dynamic switch that is connected to the card slot, and a wireless transmission/reception interface. In a condition, receiving a request to access the micro SD card from the wireless transmission/reception interface, the dynamic switch in the processing chip will immediately perform the arbitration of the request. The request will be granted if there is no on-going transaction from the transmission/reception interface from the electronic device to the micro SD card. The request from the wireless transmission/reception interface will only be granted only when the on-going data transaction is completed between the electronic device and the micro SD card if there is any. The

priority of the arbitration of the request from the wireless transmission/reception interface and electronic device is configurable.

5 【0008】 The dynamic switch consists of FIFO (first-in first-out) that will buffer the requests from both wireless interface module and electronic devices to be processed in order to improve the performance of the arbiter. As a result, the dynamic switch controls the transaction traffic dynamically between the wireless transmission/reception
10 interface, the electronic device and also the micro SD storage that allows simultaneous activities in these three interfaces.

 【0009】 Preferably, the electronic device is selected from a group consisting of digital camera, PDA (Personal Digital Assistant), tablet computer, smart phone, laptop and any
15 electronic device that has SD interface. In addition, the micro SD card slot is formed with a plurality of conductive terminals for electrically coupled to the micro SD card and the dynamic switch.

 【0010】 In addition, the wireless transmission/reception
20 interface is selected from a group consisting of Wimax (Worldwide Interoperability for Microwave Access), Wi-Fi (Wi-Fi network), RF (Radio Frequency), Bluetooth, GPS (Global Positioning System) and GSM (Global System for Mobile Communication). The processor unit is selected from
25 a group consisting of MCU (Multipoint Control Unit) and CPU (Central Processing Unit).

 【0011】 In comparison to the prior arts without the fast hardware dynamic switch, the storage card can only conduct a single operation at one time and cannot perform several

operations simultaneously. In addition, the presently available SD storage card adapter does not have the processing unit with wireless capability.

5 **BRIEF DESCRIPTION OF THE DRAWINGS**

 【0013】 Other features and advantages of this invention will be described in more detail in the following detailed description of a preferred embodiment of this invention, with reference to the accompanying drawings, in which:

10 【0014】 FIG. 1 shows a block diagram representing the elements of a card adapter device of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

15 【0015】 The micro SD card adapter device of the present invention is adapted to receive storage cards of different specifications. A preferred embodiment is given in following paragraphs for better understand of the present invention, however the scope of the present invention should not be limited to those given in the examples only.

20 【0016】 Referring to FIG. 1, wherein FIG. 1 shows a block diagram representing the elements of a card adapter device of the present invention. As shown, the micro SD card adapter device 1 of the present invention includes a micro SD card slot 11, a normal SD interface that connects to
25 electronics devices 12, a processing chip with dynamic switch 13 and a wireless transmission/reception interface 14. The card slot 11 is formed with a plurality of conductive terminals 111 (only one is shown in the drawing) and is used

for receiving a micro SD (Secure Digital) card 2 therein. The processing chip 13 includes a dynamic switch 131 and a processor unit 132. The dynamic switch 131 is coupled electrically to the micro SD card slot 11 such that the
5 conductive terminals 111 extend into the card slot 11 so as to establish electrical communication with the dynamic switch 131. The processing chip 13 further includes a FIFO (first-in first-out) or RAM 1311 (Random Access Memory). The SD interface 12 and the processor unit 132 are
10 electrically coupled to the dynamic switch 131, wherein the processor unit 132 is selected from a group consisting of MCU (Multipoint Control Unit) and CPU (Central Processing Unit).

【0017】 The wireless transmission/reception interface 14
15 is coupled electrically to the dynamic switch 131, wherein the wireless transmission/reception interface 14 is selected from a group consisting of Wimax (Worldwide Interoperability for Microwave Access), Wi-Fi (Wi-Fi network), RF (Radio Frequency), Bluetooth, GPS (Global Positioning
20 System) and GSM (Global System for Mobile Communication).

【0018】 In one embodiment of the present invention, the SD interface 12 is coupled electrically to an electronic device (not visible) so that the conductive terminals 111 of the card
25 slot 11 are in contact with a Micro SD (Secure Digital) card 2, thereby establishing electrical communication therebetween. Preferably, the electronic device is selected from a group consisting of a digital camera, a PDA (Personal Digital Assistant), a tablet computer and a smart phone.

【0019】 If the electronic device presently employed is a digital camera, then the processor unit 132 is a CPU so that once the Micro SD card 2 is inserted into the card slot 11 the digital camera is electrically connected to the SD card 2 via the card adapter device 11 of the present invention. Under this condition, the SD interface 12 is electrically coupled with the digital camera while the conductive terminals 111 and the SD card 2 are in electrical communication relative to each other.

【0020】 When a user wishes to transmit the data stored within the SD card 2 to a smart phone by utilizing the wireless transmission/reception interface 14 of the card adapter device of the present invention, the user only needs to activate the wireless transmission/reception interface 14, wherein the wireless transmission/reception interface 14 transmits a first signal S1 (i.e., a first request) to the dynamic switch 131 and the first signal S1 is stored temporarily in the RAM 1311. Under this condition, the dynamic switch 131 detects an operation mode of the SD interface 12 (i.e., to detect whether the digital camera is in use or not). Upon detecting that the SD interface 12 is in an idle mode (i.e., the digital camera is in use), the processor unit 132 converts the dynamic switch 131 to be coupled electrically to the wireless transmission/reception interface 14, thereby enabling the dynamic switch 131 to transfer the first signal S1 from the RAM 1311 into the card slot 11 (the SD card), which, in turn, enables the wireless transmission/reception interface 14 to access into the SD card 2. Since transmission of data from the smart phone to the SD card 2 in the card adapter device

1 of the present works in the same manner, a detail
description thereof is omitted herein for the sake of brevity.

5 【0021】 Moreover, the user of the digital camera wishes to
take photographs and simultaneously transmit the data from
the Micro SD card 2 or vice versa. Under this condition, the
user only needs to activate the SD interface 12, wherein the
SD interface 12 transmits a second signal S2 (i.e., a second
request) to the dynamic switch 13, where the second signal
S2 is stored within the RAM 1311 and the dynamic switch
10 131 utilizing the second signal S2 to detect an operation
mode of the wireless transmission/reception interface 14
and upon detecting that operation of the wireless
transmission/reception interface 14 is interrupted, the
processor unit 132 requests the dynamic switch 131 to be
15 coupled electrically to the SD interface 12 so as to enable the
dynamic switch 131 to transmit the second signal S2 from
the RAM to the card slot 11, which, in turn, enables the SD
interface 12 to access into the SD card 2. At this time, the
image data captured by the digital camera is stored within
20 the Micro SD card 2.

 【0022】 To make it short, whether the SD interface 12
transmits the second signal S2 or the wireless
transmission/reception interface 14 transmit the first signal
S1 to the dynamic switch 131, the latter will constantly
25 detect the operation mode of the SD interface 12 or the
wireless transmission/reception interface 14, where the
processor unit 132 converts the state of the dynamic switch
131 depending on the operation mode of the former two,
thereby achieving the intended features (transmission or

reception of image data and taking of photographs by the digital camera can be conducted simultaneously).

5 【0023】As explained above, when the card adapter device of the present invention is used together with a portable electronic device, transmission and reception of data can be conducted via the wireless communication since the dynamic switch detects constantly the operation mode of the SD interface and the wireless transmission/reception interface, thereby switching the dynamic switch to be coupled
10 electrically with either the SD interface of the wireless transmission/reception interface and enabling one of them to access the SD card in the card slot, hence providing convenience in transmission or storage of image data in the SD card.

15 【 0024 】 While the invention has been described in connection with what is considered the most practical and preferred embodiments, it is understood that this invention is not limited to the disclosed embodiments but is intended to cover various arrangements included within the spirit and
20 scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

What is claimed is:

1. A micro SD card adapter device comprising:

a micro SD (Secure Digital) card slot for receiving a micro SD card therein;

5 a normal SD interface for coupling electrically to an electronic device;

a processing chip including

a dynamic switch coupled electrically to said card slot and said SD interface, and

10 a processor unit coupled electrically to said dynamic switch; and

a wireless transmission/reception interface coupled electrically to said dynamic switch;

wherein, in a condition upon receiving a first request
15 from said wireless transmission/reception interface, said dynamic switch detects an operation mode of said SD interface and upon detecting that said SD interface is in an idle mode, said processor unit converts said dynamic switch to be coupled electrically to said wireless
20 transmission/reception interface, thereby enabling said dynamic switch to transfer said first request to said card slot, which, in turn, enables said wireless transmission/reception interface to access into said SD card, said dynamic switch arbitrating said request from said wireless
25 transmission/reception interface and said SD interface.

2. The card adapter device according to claim 1, wherein said processing chip further includes a FIFO (first-in first-out) or

RAM (Random Access Memory) such that once said dynamic switch is converted so as to be electrically to said wireless transmission/reception interface, said SD interface transmits a second request to said dynamic switch, where
5 said second request is stored within said FIFO or RAM and said dynamic switch utilizing said second request to detect an operation mode of said wireless transmission/reception interface and upon detecting that operation of said wireless transmission/reception interface is interrupted, said
10 processor unit converting said dynamic switch to be coupled electrically to said SD interface so as to enable said dynamic switch to transmit said second request from said RAM to said card slot, which, in turn, enables said SD interface to access into said SD card.

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3. The card adapter device according to claim 1, wherein said wireless transmission/reception interface is selected from a group consisting of Wimax (Worldwide Interoperability for Microwave Access), Wi-Fi (Wi-Fi network), RF (Radio
20 Frequency), Bluetooth, GPS (Global Positioning System) and GSM (Global System for Mobile Communication).

4. The card adapter device according to claim 1, wherein said processor unit is selected from a group consisting of MCU
25 (Multipoint Control Unit) and CPU (Central Processing Unit).

5. The card adapter device according to claim 1, wherein said electronic device is selected from a group consisting of a digital camera, a PDA (Personal Digital Assistant), a tablet

computer, a smart phone or any electronic device has SD interface.

5 6. The card adapter device according to claim 1, wherein said card slot is formed with a plurality of conductive terminals for electrically coupled to said SD card and said dynamic switch.