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(54) **WIRELESS MULTIMEDIA PLAYER**

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709/219

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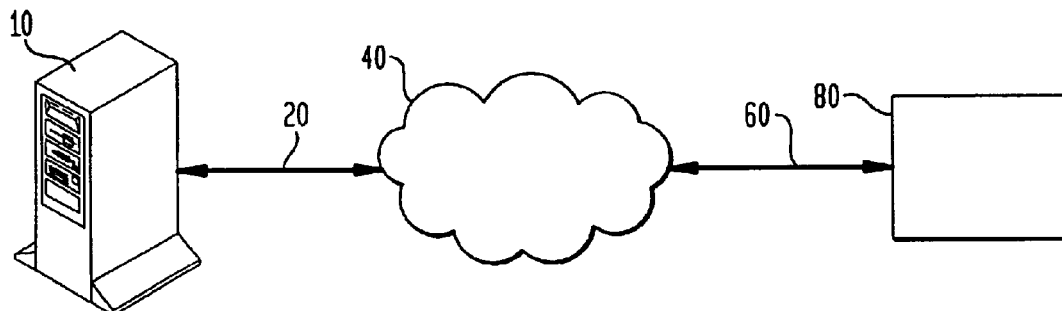
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(57) **ABSTRACT**

A wireless device, system and method for receiving and playing multimedia files streamed from a multimedia server over a wireless telecommunications network. A desired multimedia file is selected from one or more multimedia files stored in the multimedia server, which server is operatively connected to the wireless telecommunications network. Successive blocks of data from the desired multimedia file are streamed over the wireless telecommunications network in a digitized and compressed format and received by the wireless telecommunications device. The received blocks of data from the streamed multimedia file are temporarily stored in a buffer in the wireless device, decoded and decompressed, and successively played through an audio and/or video output in the wireless device. The wireless device monitors the blocks of data stored in the buffer and signals the wireless telecommunications network to increase the rate that the data blocks are transmitted over the wireless network in the event that the data stored in the buffer falls below a minimum threshold level.

69 Claims, 1 Drawing Sheet



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FIG. 1

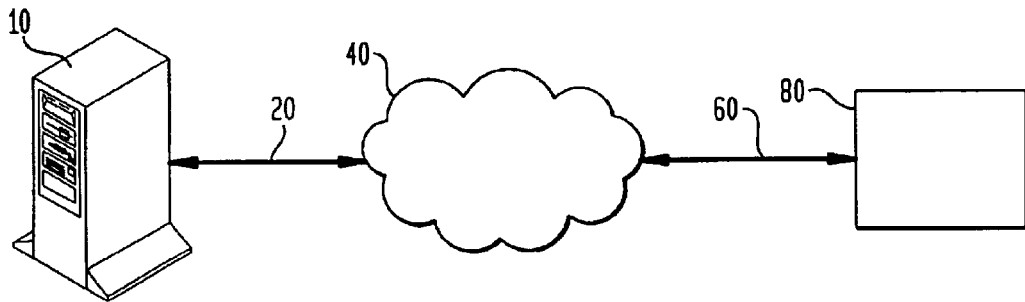
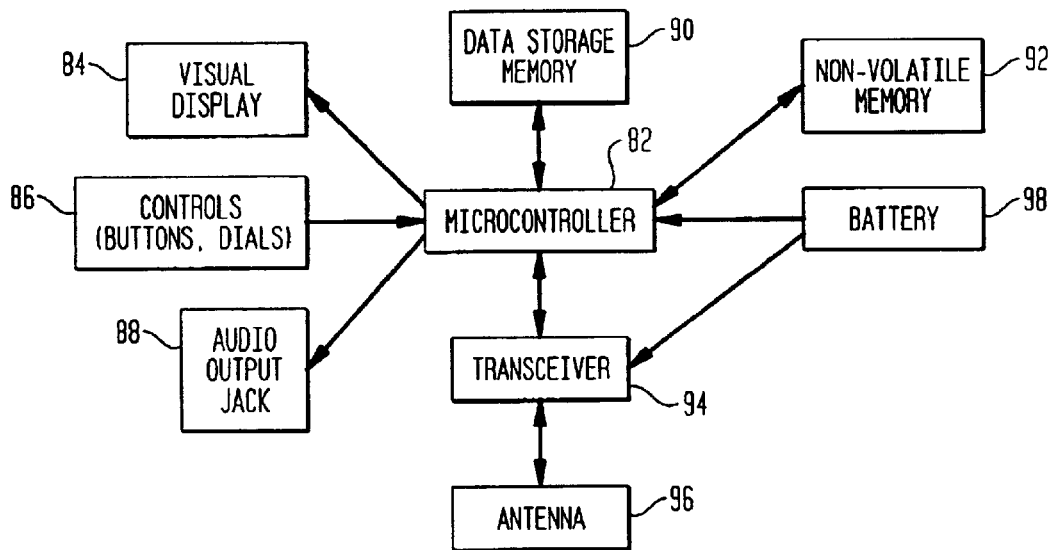


FIG. 2



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WIRELESS MULTIMEDIA PLAYER**BACKGROUND OF THE INVENTION**

1. Field of the Invention

The present invention relates generally to the field of multimedia communications and, more particularly, to a method and device for streaming and/or storing high quality, real time multimedia information over a wireless telecommunications network.

2. Description of the Related Art

In recent years, the availability of multimedia information (e.g., audio, video, data, etc.) to consumers has grown tremendously. Currently, with the popularity of the Internet, high quality, digital multimedia information can readily be obtained by a user of a personal computer hard wired to a multimedia server over the Internet.

One common example is the transmission and downloading of digital audio data files (e.g., music) from a multimedia server connected to a user's computer over the Internet. The user is able to select desired audio files from a list of such files stored in or otherwise accessible by the multimedia server. To ensure high quality and minimal degradation of the original audio source, such digital audio files are typically encoded and compressed in a file format, such as MPEG, audio layer 3 ("MP3"). Software stored on the user's computer (e.g., MP3 player) enables the user to play such downloaded digital audio data files by opening, decoding and decompressing the audio file at the user's computer.

In addition to downloading and storing such digital audio files to a user's computer over the Internet, it is also known to stream the audio data file to the user's computer from the multimedia server over the Internet without otherwise downloading or permanently storing the audio file in the user's computer. Streaming of the audio data file allows the user to decode, decompress and play the audio file almost immediately without waiting for the complete audio data file to first be downloaded to the user's computer.

In today's increasingly mobile society, it is desirable for a user to access and play high quality multimedia files using a portable device that can be carried by the user. Existing portable devices play MP3 audio data files that have previously been downloaded to the user's computer and then downloaded from the computer to the portable device over a cable connection (e.g., through a serial port on the computer). These existing devices utilize the user's computer as an intermediate connection between the portable device and the multimedia server to ultimately store MP3 audio files on the portable device. A disadvantage of such existing devices is that the user must select the particular audio files to be downloaded to the portable device, and arrange to download and store such files in the device prior to using the portable device. Furthermore, while advances have been made on the available memory in such portable devices, the number of audio files that can be downloaded and stored in the portable device continue to be limited by the memory associated with the device.

It would be advantageous to have a portable device capable of playing multimedia files, such as high quality, digital audio files, in real time without first having to download the preselected files from the user's computer for ultimate transfer and storage in the portable device prior to playing. It would also be advantageous for the user to access

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server. To avoid the entertainment industry's concerns over unauthorized reproduction of such copyrighted multimedia files, it would be desirable for the portable device to be capable of playing the multimedia file without storing the multimedia file in the device's memory for subsequent use.

SUMMARY OF THE INVENTION

The foregoing and other objects and advantages are achieved in accordance with the present invention through the provision of a portable device that receives and plays streamed multimedia files over a wireless network from a multimedia server.

In accordance with the present invention, a system, method and wireless device are provided for receiving and playing multimedia files streamed from a multimedia server over a wireless telecommunications network. A desired multimedia file is selected from one or more multimedia files stored in the multimedia server, which server is operatively connected to the wireless telecommunications network. Successive blocks of data from the desired multimedia file are streamed over the wireless telecommunications network in a digitized and compressed format and received by the wireless telecommunications device. The received blocks of data from the streamed multimedia file are temporarily stored in a buffer in the wireless device, decoded and decompressed, and successively played through an audio and/or video output in the wireless device.

In accordance with a preferred aspect of the present invention, the wireless device receives the blocks of data over the wireless telecommunications network at a first transmission rate until a minimum threshold level of data is stored in the buffer and at a second transmission rate after the minimum threshold level of data is stored in the buffer, the first transmission rate being higher than the second transmission rate when at least the minimum threshold level of data is stored in the buffer. A microprocessor in the wireless device monitors the size of the buffer to ensure that the data contained in the buffer does not fall below the minimum threshold level prior to receiving all of the blocks of data associated with the streamed multimedia file. If the size of the buffer falls beneath the minimum threshold level, the microprocessor signals the wireless telecommunications network to increase the rate that data is transmitted to the device over the wireless telecommunications network until the data contained in the buffer reaches or exceeds the minimum threshold level.

In a preferred embodiment of the invention, the user of the device may be billed for the use of the multimedia file prior to streaming the multimedia file to the wireless device. In another preferred embodiment, an authentication code is required to play multimedia files stored in a local memory of the wireless device, which code is transmitted to the wireless device upon receipt of payment information from the user of the device.

The foregoing specific objects and advantages of the invention are illustrative of those that can be achieved by the present invention and are not intended to be exhaustive or limiting of the possible advantages which can be realized. Thus, these and other objects and advantages of this invention will be apparent from the description herein or can be learned from practicing this invention, both as embodied herein or as modified in view of any variations which may be apparent to those skilled in the art. Accordingly, the present invention resides in the novel parts, constructions,

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing features and other aspects of the invention are explained in the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a block diagram of a wireless multimedia communications system in accordance with the present invention; and

FIG. 2 is a block diagram of a portable device for receiving and playing multimedia files over a wireless network in accordance with the present invention.

DETAILED DESCRIPTION

The present invention provides a system, method and portable, wireless device for receiving, playing and storing streamed multimedia files over a wireless telecommunications network from a multimedia server. A preferred embodiment of the present invention is described below with reference to the drawings.

FIG. 1 is a block diagram illustrating a preferred wireless multimedia communications system in accordance with the present invention. A multimedia server 10 is connected to a telecommunications network 40 via communications link 20. High quality, digital multimedia files (e.g., audio, video, data, etc.) are stored within or otherwise accessible to the multimedia server 10. Preferably, the multimedia files are stored within the server 10 in an encoded and compressed file format, such as MP3. The multimedia server 20 may be a conventional third party server accessible over the Internet or a dedicated server maintained by the network provider.

While only one server 10 is illustrated in FIG. 1, it is understood that more than one multimedia server 10 may be utilized in accordance with the present invention. For instance, several multimedia servers 10 may be either linked to one another or otherwise connected to the telecommunications network 40 via one or more communications links 20.

The telecommunications network 40 may be a known wireless communications network or a combination of a wireless network interconnected with a conventional land-based telecommunications network, such as the Public Switched Telephone Network ("PSTN"). The wireless network is preferably a high bandwidth network capable of operating at speeds in excess of 144 kbps, such as a wideband Code Division Multiple Access ("CDMA") platform. Other known wireless platforms, such as the Universal Mobile Telecommunications System ("UMTS"), Local Multipoint Distribution System ("LMDS"), Global Systems for Mobile ("GSM") and even satellite-based systems (e.g., the Teledesic network), may be utilized as the wireless network in accordance with the present invention.

A portable wireless multimedia device 80, capable of decoding streamed, compressed data for playback to the user in real time, is connected to the network 40 over a wireless channel 60. As will be discussed below, the user of the wireless device 80 is able to access the multimedia server 10 over the network 40 to select one or more desired multimedia files stored or otherwise accessible to the server 10. The selected multimedia files are streamed to the wireless device 80 over link 20 through the network 40 and to the wireless device 80 over wireless channel 60. The streamed multimedia files are decoded, decompressed and played by the wireless device 80.

A preferred embodiment of the wireless device 80 is illustrated in FIG. 2. The wireless device 80 includes a

The wireless device 80 also includes an antenna 96 and a transceiver 94 for transmitting or receiving information over wireless channel 60. The antenna 96 is connected to the transceiver 94 to facilitate transmission or reception of information/data over the wireless channel 60. Preferably, a conventional wideband transceiver and antenna are used in the wireless device 80. The transceiver 94 is connected to the microprocessor 82.

A battery 98, such as a conventional lightweight lithium-ion rechargeable battery, provides power to the wireless device 80. Preferably, the battery 98 is electrically connected to each of the various components of the wireless device 80 that require power, either directly or via the microprocessor 82. The microprocessor 82 may be configured to regulate the power consumption of the various components of the device 80.

The wireless device 80 also includes a data storage memory 90 and a non-volatile memory 92, each of which is connected to the microprocessor 82. The data storage memory 90 is the buffer used for streaming and/or the flash memory for storing the multimedia files in the wireless device 80. Multimedia files stored in the data storage memory 90 may be erased or recorded over. A conventional 8 Mbyte flash memory is suitable for use as the data storage memory 90. However, if the multimedia file is only being streamed and not stored in the device 80, then conventional 1, 2 or 4 Mbyte flash memory chips may be used as a buffer for streaming of multimedia files to the wireless device 80.

The non-volatile memory 92 serves as the ROM for the wireless device 80, permanently storing programmed information (e.g., software for decoding and decompressing the multimedia file) and data for running the microprocessor 82.

The wireless device 80 also includes a visual display 84, controls 86 and an audio output 88, each of which are connected to the microprocessor 82. The visual display 84 is used to display information to the user of the wireless device 80, such as playing a streamed video data file, displaying selections, operating the device 80, and providing feedback to the user regarding battery life and connection to the network 40. The display 84 may be a conventional LCD, touch display or LED display.

The controls 86 allow the user to operate the wireless device 80 and interface with the microprocessor 82. Various input controls (e.g., buttons, dials, soft keys, jog shuttles, etc.) may be used to allow the user to turn power to the device 80 on or off, to select desired multimedia files for streaming and/or downloading, to select user preferences for the device 80, or to scroll through different options.

The audio output 88 allows the user of the wireless device 80 to listen to a streamed or downloaded audio data file through one or more audio speakers (not shown) that may be incorporated into the wireless device 80 or otherwise connected through a conventional audio jack (e.g., headphones).

In operation, the user turns the power on to the wireless device 80 by selecting the appropriate input control 86. By selecting the appropriate input control 86, the user may view different songs, artists, genres, file names, etc. through the visual display 84. The user may also view a list of previous files (e.g., songs) and/or links that were previously accessed and stored in the data storage memory 90 of the device 80. Upon making a selection via the appropriate input control 86 and visual display 84, the user may access and listen to and/or view the selected multimedia file previously stored in the data storage memory 90 without establishing a connection to the network 40 over wireless channel 60.

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