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Movie File Download Device and Method

Field of the Invention

The present invention relates to movie file processing technologies, and more particularly, to a device and method for downloading a movie file.

Background of the Invention

With the development of broadband Internet, network video resources provided by the Internet are becoming richer. It has been a very popular demand to download movies from the Internet. At present, there are many kinds of downloading software capable of meeting the users' demand for downloading movie files.

Protocols supported by general downloading software includes Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), Bit Comet (BT) downloading protocol, eDonkey2000 network (ED2K) (eMule) protocol, Multimedia Message (MMS) protocol, Real Time Streaming Protocol (RTSP), and so on. The different downloading protocols have different downloading features. HTTP and FTP are conventional file transfer protocols, based on the Client/Server architecture, a client downloading software pulls file content to be downloaded in turn from a server. BT and ED2K (eMule) protocol are new Peer-to-Peer (P2P) protocols. The P2P protocol is also called Peer to Peer Internet technique, which is different from the conventional Client/Server architecture, clients participating in the downloading constitute a node network in the P2P technique, and one client may obtain file data to be downloaded from any other client in the network rather than totally depend on the server. MMS and RTSP are streaming media transfer protocols, which are used to transfer real-time media stream, such as Windows Media, published by a streaming media server.

As can be seen from above-mentioned protocol classifications, except that MMS and RTSP are protocols developed specifically for network media, all other protocols, when downloading a movie file, are taking the movie file as an ordinary file. Figure 1 is a schematic diagram illustrating system architecture of existing general downloading software. As shown in figure 1, a network downloading module downloads file data to a local file according to file segmenting information provided by a file segmenting module.



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The existing downloading software performs no specific processing on the movie file. Instead, the existing downloading software equally segments the movie file (for instance, each 512KB is taken as a basic unit) as segmenting an ordinary file. In order to improve downloading efficiency, a downloading client may simultaneously download data segments of different positions from multiple nodes in a node network. However, this downloading mechanism will result in file positions of downloaded data segments are not consecutive, and according to video encoding theory, non-consecutive data blocks are unable to be played. Therefore, it is usually necessary for the conventional downloading software to totally download a movie before the movie can be played. Thus it is necessary for a user to wait for a long time, and the user can not determine in advance whether the movie content meets the user's demand, and can not preview highlights of the movie ahead of time.

In the existing file segmenting method, video data of each frame in the movie is usually segmented into two units, and it can not be located that the position of the key frame starts from which data segment. Therefore, it is difficult to decode a movie file without being totally downloaded into complete video frames, and then a preview function of the movie file can not be achieved. A user must preview the movie file in turn or watch the movie file after the movie file is completely downloaded, which results in a long wait time; or the movie completely downloaded can not satisfy the user's demand, which results in a waste of downloading time.

Summary of the Invention

In view of above, embodiments of the present invention provide a device for downloading a movie file and a method for downloading a movie file, which can achieve a quickly preview of the movie content, and avoid wasting the downloading time.

The device for downloading a movie file provided by embodiments of the present invention includes: a file parsing module, a file segmenting module, a network downloading module and a preview playing module; in which,

the file parsing module is to, according to a type of a movie file to be downloaded, send a first instruction to the network downloading module, and receive characteristic data came from the downloading module; obtain position information of key frames of

the movie file to be downloaded from the characteristic data, and output the position information of key frames to the file segmenting module; and send a second instruction to the network downloading module;

the file segmenting module is to receive the position information of key frames sent from the file parsing module, segment the movie file according to the position information of key frames, and output file segmenting information to the network downloading module;

the network downloading module connected with a downloading server or a downloading node through a network connection, is configured to, after receiving the first instruction, download characteristic data of a file header and a file tail of the movie file; after receiving the second instruction, download movie file data according to the file segmenting information sent from the file segmenting module;

the preview playing module is configured to implement the preview playing using downloaded movie file data.

The preview playing module is further to, according to a position of data being played, send a third instruction to the network downloading module;

The network downloading module is further to download data to be played according to the third instruction came from the preview playing module.

The network downloading module is further to store the downloaded movie file data into a local file.

The network downloading module adopts Peer-to-Peer, P2P, downloading mode, serially downloading mode or preview downloading mode.

The preview playing module serially plays images of key frames in downloaded movie file data.

The preview playing module is further to serially play the movie file utilizing downloaded movie file data.

The method for downloading a movie file provided by embodiments of the present invention includes:

obtaining position information of key frames of a movie file to be downloaded;

segmenting the movie file according to the position information of key frames;

downloading movie file data according to file segmenting information, and

utilizing downloaded movie file data to implement the preview playing.

The obtaining position information of key frames of a movie file to be downloaded

includes:

according to a type of the movie file to be downloaded, downloading characteristic data of a file header and a file tail of the movie file;

obtaining position information of key frames of the movie file to be downloaded from the characteristic data.

The method further includes:

downloading movie file data according to a position of data being played.

The method further includes:

serially playing images of key frames in downloaded movie file data.

The method further includes:

serially playing the movie file utilizing downloaded movie file data.

As can be seen from the above technical solutions provided by the present invention, the technical solutions includes a file parsing module, a file segmenting module, a network downloading module and a preview playing module. The file segmenting module segments a movie file according to position information of key frames parsed by the file parsing module; the network downloading module downloads file data according to file segmenting information; the preview playing module implements a rapidly preview of movie content using downloaded file data. The technical solutions provided by the present invention helps users quickly know about the outline of the movie, achieves the purpose for previewing content segments in which a user is interested in advance, and avoids a waste of downloading time.

Brief Description of Drawings

Figure 1 is a schematic diagram illustrating system architecture of existing general downloading software;

Figure 2 is a schematic diagram illustrating a structure of a device for downloading a movie file;

Figure 3 is a flowchart illustrating a method for downloading a movie file;

Figure 4 is a schematic diagram illustrating a structure of a RMVB file.

Detailed Description of the Invention

In general, there are two types of video encoding frames, namely, I-frame and

P-frame. I-frame is also called intra-frame reference frame or key frame. When an I-frame is encoded, only information in the image frame is referred to, so the I-frame may be independently decoded. P-frame is also called forward reference frame. When a P-frame is encoded, information of previous frame is referred to, so when the P-frame is decoded, data of a previous frame is needed. When a movie file is encoded, a key frame, that is, an I-frame is inserted in P-frames at an interval of several seconds. Thus the decoding and playing may be started from the key frames, and then forward reference frames may be decoded in turn.

Since key frames may be independently decoded, data of the key frames is relatively more important in movie file data. In general, positions of key frames in a movie file will be recorded in structure descriptions of the movie file. The present invention segments the movie file utilizing position information of the key frames, and downloads file data according to file segmenting information, rapidly previews movie content using downloaded file data, which helps users quickly know about the outline of the movie, preview content segments in which a user is interested in advance. There exists data of a key frame at each time interval of a movie file. Supposing that the time interval is T , the average data size of a key frame is N times of that of a non-key frame, and the movie frame rate is F , the ratio of key frame data to non-key frame data in a movie file is $N:(T \cdot F - 1)$, in which, $*$ denotes multiplying. An example is provided in which the time interval of key frame data is 10 seconds, the frame rate is 25 frames per second, and the data size of a key frame is 5 times of that of a non-key frame, then the ratio of key frame data to non-key frame data is 1:50 based on empirical data. Namely, it is possible to extract key frame data which is about 2 percent of data of the movie file to achieve quick sampling of the movie content. Sampled key frame data may be used to achieve the preview playing of the present invention, and help users know about the outline of the movie.

Figure 2 is a schematic diagram illustrating a structure of a device for downloading a movie file. As shown in figure 2, the device includes a file parsing module, a file segmenting module, a network downloading module and a preview playing module.

The file parsing module is configured to, according to the type of a movie file to be downloaded, send a first instruction to the network downloading module for instructing the network downloading module to download characteristic data of the file header and the file tail, obtain position information of key frames of the movie file to be downloaded

from the characteristic data, and output the position information of key frames to the file segmenting module; and send a second instruction to the network downloading module.

The file segmenting module is configured to receive the position information of key frames came from the file parsing module, segment the movie file according to the received position information of key frames, and output file segmenting information to the network downloading module.

The network downloading module connected with a downloading server or a downloading node through a network connection, is configured to, after receiving the first instruction, download characteristic data of the file header and the file tail of the movie file; after receiving the second instruction, download movie file data according to the file segmenting information came from the file segmenting module. The network downloading module is further configured to store downloaded movie file data into a local file.

The preview playing module is configured to implement the preview playing using the downloaded movie file data. The preview playing module is further configured to, according to the position of data being played, send a third instruction to the network downloading module for instructing the network downloading module to firstly download the data to be played. Correspondingly, the network downloading module is further configured to download file data according to the third instruction came from the preview playing module.

Figure 3 is a flowchart illustrating a method for downloading a movie file. As shown in figure 3, the method includes the following processes.

Block 300, position information of key frames of a movie file to be downloaded is obtained.

The block includes: characteristic data of a file header and a file tail of the movie file is downloaded according to the type of the movie file, and position information of key frames of the movie file to be downloaded is obtained from the characteristic data.

Block 301, the movie file is segmented according to the position information of key frames of the movie file.

Block 302, movie file data is downloaded according to file segmenting information, and download movie file data is utilized to implement the preview playing.

Furthermore, the method of the embodiment further includes: file data is downloaded according to the position of data being played.

Since structures of files with different movie file formats are different, the device for downloading a movie file shown in figure 2 and the method for downloading a movie file shown in figure 3 will be described in detail hereinafter with reference to concrete examples. A file of RMVB video file format is taken as an example.

At first, movie downloading is started. A general movie file consists of three parts, that is, description information in the file header (denoted by HEAD), audio and video data in the file (denoted by DATA) and index data in the file tail (denoted by INDX). The size of description information in the file header and the index data in the file tail are usually smaller, for example, the size of file header data or file tail data of a RMVB file is about 512KB. The file parsing module sends the first instruction to the network downloading module, the network downloading module firstly downloads the file header data and the file tail data. The sizes of file header data and file tail data of different movie files are different, as shown in table 1. Therefore, the size of file header data and file tail data to be downloaded may be determined based on the experience.

	RMVB format	AVI format	FLV format	...
Size of HEAD	512KB	2MB	512KB	
Size of INDX	512KB	16MB	0KB	

Table 1

As shown in table 1, the RMVB format is taken for an example, and the file parsing module will instruct the network downloading module to firstly download 512KB data of the file header and 512KB INDX data of the file tail.

And then, the file parsing module will parse out position information of key frames. For most of movie file container formats, position information of key frames will be recorded in INDX data of the file tail. Therefore, for a movie file including INDX data, the file parsing module will parse out position information of key frames. The RMVB is taken for an example, and the parsing process generally includes the following.

1) Figure 4 is a schematic diagram illustrating a structure of a RMVB file. As shown in figure 4, description information of a file is parsed out according to keywords 'RMF', 'PROP', 'MDPR' and 'CONT' ('RMF' denotes that the file is a file of Real format, 'PROP' denotes an attribute of the file, 'MDPR' denotes an attribute of media streams, 'CONT' denotes file content description) in the file header. The description information of the file may include playing time of the file, number of audio and video streams, type of audio and video encoding, audio and video bit rate, and the like. The specific

information may refer to relevant disclosed documents, which can be easily obtained by those skilled in the art, no further descriptions will be provided.

2) The INDX data block in the file tail is parsed out. Main information of the INDX data block consists of multiple index records, each index record may be denoted by the following structure.

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struct {UINT32 tStart, ptrFilePos, packet;} IndexRecord;
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Each index record corresponds to position information of a key frame. In above structure, ptrFilePos denotes an absolute position of the key frame in the file, tStart denotes file time corresponding to the key frame, and packet denotes the number of data packets between the key frame and next key frame.

Subsequently, the file parsing module outputs an obtained index record list to the file segmenting module. The file segmenting module segments the movie file into file blocks according to positions of key frames, rather than segments the movie file into file blocks equally (for instance, the size of each file block is 512KB) as the existing general downloader does. In the embodiment of the present invention, the advantage of segmenting the file according to position information of key frames is as follows. Each basic unit may be played independently. There are multiple existing specific methods for segmenting a file in the art, no further descriptions will be provided here. The present invention emphasizes that the file segmenting module segments a movie file according to positions of key frames.

The file segmenting module sends file segmenting information to the network downloading module, and the network downloading module downloads corresponding data segments according to the file segmenting information. The network downloading module may adopt three downloading modes, that is, Peer-to-Peer (P2P) downloading mode, serially downloading mode and preview downloading mode.

In the P2P downloading mode, data segments of different positions may be simultaneously downloaded from multiple downloading nodes. Since the data segments of different positions are segmented according to positions of key frames, a video decoder may decode the data segments, and each data segment may be played independently. That is to say, the downloaded data segments may be played before the movie file has been totally downloaded, and it is not necessary for a user to wait for a long time to determine whether the content of the movie file meets the user's needs ahead of time.

In the serially downloading mode, data segments are downloaded from start to

finish in time sequence.

In the preview downloading mode, image data of the first frame of each data segment is firstly downloaded. Based on experience, data of the key frames, namely, the first frame of each data segment, are only about 2% of the movie file, so in the preview downloading mode, by downloading data of key frames, the quickly downloading of a movie file is achieved, and highlights of the movie file may be previewed in advance.

Finally, after the data of key frames is downloaded, the preview playing module may start the preview playing. The preview playing module may firstly provide a story slideshow function. With the story slideshow function, key frames images in downloaded movie file data may be serially played at a certain interval. Because the key frame images are evenly distributed in the complete file range, the story slides may allow a user quickly know about the summary of the whole movie. The story slideshow function is a conventional technique to those skilled in the art, and the specific implementation is not used to limit the protection scope of the present invention. It is emphasized in the present invention that the downloaded key frame images are serially played at a certain interval.

Furthermore, the preview playing module further provides a highlight preview function and a playing while downloading function. When the story slides are played to a scene in which the user is interested, the user may click a playing button to watch wonderful segments from the position corresponding to the scene in the file. At this time, the preview playing module will send the third instruction to the network downloading module for instructing the network downloading module to firstly download data segments to be played. With the playing while downloading function, the data segments to be played may be serially downloaded from the beginning of the file. And then the preview playing module may completely play the movie utilizing the data segments.

The foregoing description is only preferred embodiments of the present invention and is not used for limiting the protection scope thereof. Any modification, equivalent substitution, or improvement made without departing from the spirit and principle of the present invention should be covered by the protection scope of the present invention.

Claims

1. A device for downloading a movie file, comprising: a file parsing module, a file segmenting module, a network downloading module and a preview playing module; wherein,

the file parsing module is to, according to a type of a movie file to be downloaded, send a first instruction to the network downloading module, and receive characteristic data came from the downloading module; obtain position information of key frames of the movie file to be downloaded from the characteristic data, and output the position information of key frames to the file segmenting module; and send a second instruction to the network downloading module;

the file segmenting module is to receive the position information of key frames sent from the file parsing module, segment the movie file according to the position information of key frames, and output file segmenting information to the network downloading module;

the network downloading module connected with a downloading server or a downloading node through a network connection, is to, after receiving the first instruction, download characteristic data of a file header and a file tail of the movie file; after receiving the second instruction, download movie file data according to the file segmenting information sent from the file segmenting module;

the preview playing module is configured to implement the preview playing using downloaded movie file data.

2. The device according to claim 1, wherein the preview playing module is further configured to, according to a position of data being played, send a third instruction to the network downloading module;

wherein the network downloading module is further to download data to be played according to the third instruction came from the preview playing module.

3. The device according to claim 1 or 2, wherein the network downloading module is further to store the downloaded movie file data into a local file.

4. The device according to claim 3, wherein the network downloading module adopts Peer-to-Peer, P2P, downloading mode, serially downloading mode or preview

downloading mode.

5. The device according to claim 1, wherein the preview playing module serially plays images of key frames in downloaded movie file data.

6. The device according to claim 1 or 5, wherein the preview playing module is further to serially play the movie file utilizing downloaded movie file data.

7. A method for downloading a movie file, comprising:

obtaining position information of key frames of a movie file to be downloaded;

segmenting the movie file according to the position information of key frames;

downloading movie file data according to file segmenting information, and

utilizing downloaded movie file data to implement the preview playing.

8. The method according to claim 7, wherein obtaining position information of key frames of a movie file to be downloaded comprises:

according to a type of the movie file to be downloaded, downloading characteristic data of a file header and a file tail of the movie file;

obtaining position information of key frames of the movie file to be downloaded from the characteristic data.

9. The method according to claim 7 or 8, further comprising:

downloading movie file data according to a position of data being played.

10. The method according to claim 7 or 8, further comprising:

serially playing images of key frames in downloaded movie file data.

11. The method according to claim 7, further comprising:

serially playing the movie file utilizing downloaded movie file data.