STORAGE MANAGEMENT OF DATA STREAMED FROM A VIDEO SOURCE DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims benefit under 35 U.S.C. §119(e) of non-provisional U.S. Patent Application No. 14/568077, filed 11 December 2014, which claims benefit under 35 U.S.C. §119(e) of provisional U.S. Patent Application No. 61/927923, filed 15 January 2014, the disclosures of which are incorporated herein by reference in their entireties.

TECHNICAL FIELD

[0002] The current disclosure relates generally to managing the storage of data streamed from a video source device.

BACKGROUND

[0003] In a typical video surveillance system, one or more cameras may be communicatively coupled to a server system. As video data is recorded by the cameras, it is forwarded to the server system where it is stored for subsequent retrieval. Client systems are communicatively coupled to the server system and may be used to request and receive streams of recorded video data.

[0004] Video surveillance systems are frequently required to be in operation twenty-four hours a day and seven days a week. As a result, large amounts of data may be recorded and stored by such systems. There are often physical limits to the amount of computing memory available for storing recorded data. The large amount of data that may be recorded in surveillance systems raises the practical issue of how to manage the data so that the desired data may be quickly accessed, while also operating within the storage capacity limits of the system.

SUMMARY

[0004a] According to a first aspect of the present invention, there is provided a computer implemented method for managing data, comprising:

a computing system identifying at least a first storage area for storing a first category of data and a second storage area for storing a second category of data;

the computing system receiving a data stream composed of a plurality of resolution encodings that encode at least a portion of a source stream using at least one different video encoding parameter;

the computing system associating one or more of the plurality of resolution encodings with the first storage area and associating one or more of the plurality of resolution encodings with the second storage area;

the computing system storing, in the first storage area, data for the one or more of the plurality of resolution encodings associated with the first storage area and storing, in the second storage area, data for the one or more of the plurality of resolution encodings associated with the second storage area;

the computing system determining data stored in at least one of the first storage area and the second storage exceeds a threshold; and

deleting data in excess of the threshold.

[0004b] According to a second aspect of the present invention, there is provided a system for managing data, comprising:

a computing processor;

computing memory communicatively coupled with the computing processor, the computing memory having stored therein computer executable instructions that when executed cause the system to perform operations comprising:

receiving a plurality of data streams, each composed of a plurality of resolution encodings that encode at least a portion of a source stream using at least one different video encoding parameter;

identifying a first data stream and a second data stream in the plurality of data streams for recording;

associating the first data stream with a first storage and the second data stream with a second storage, the first storage and the second storage allocated for storing different categories of data;

storing data from the first data stream in the first storage; and

storing data from the second data stream in the second storage.

[0004c] According to a third aspect of the present invention, there is provided a computer implemented method for managing data, comprising:

a computing system receiving a data stream, the data stream comprising a first encoding of a source stream, a second encoding of a source stream, and a third encoding of a source stream, each of the first encoding, the second encoding, and the third encoding at least a portion of the source stream using at least one different video encoding parameter;

the computing system detecting a trigger event indicating to record the data stream;

the computing system identifying from the data stream the first encoding, the second encoding, and the third encoding; and

the computing system associating each of the first encoding, the second encoding, and the third encoding with at least one of at least a first storage and a second storage, the first storage and the second storage designated for receiving different categories of data.

[0004d] According to a fourth aspect of the present invention, there is provided a computer implemented method of managing data, comprising:

a computing system receiving a data stream, the data stream composed of a plurality of resolution encodings that encode at least a portion of a source video stream using at least one different video encoding parameter;

the computing system identifying a first storage for storing the data stream;

the computing system determining whether a threshold has been exceeded in the identified first storage;

the computing system, upon determining the threshold has not been exceeded, storing data associated with the received data stream in the first storage;

the computing system, upon determining the threshold has been exceeded in the identified first storage,

identifying first data for deletion from the first storage,

deleting the identified first data for deletion,

identifying whether the threshold is exceeded after deleting the identified first data,

upon determining the threshold has not been exceeded after deleting the identified first data, storing data associated with the received data stream in the first storage; and

upon determining the threshold is exceeded after deleting the identified first data, identifying second data for deletion from the first storage.

[0004e] According to a fifth aspect of the present invention, there is provided a control system, comprising:

a receiver adapted to receive a plurality of container frames collectively comprising a single data stream over a network, the single data stream composed of a plurality of resolution encodings that encode at least a portion of a source video stream using at least one different video encoding parameter, each container frame comprising a plurality of virtual frames and a container timestamp applicable to each of the plurality of virtual frames, and each of the plurality of virtual frames being associated with one of the plurality of resolution encodings;

a processor adapted to associate each of the received plurality of virtual frames within each container frame with an encoding, identify a storage for at least one of the received plurality of virtual frames based upon the encoding associated with the at least one virtual frame, and to reconstruct a virtual stream of the associated virtual frames according to the container timestamps; and

a transmitter adapted to transmit the virtual stream over the network.

[0005] There are disclosed systems and computer implemented methods for managing data received from a video source device. In an example embodiment, a storage management system identifies at least a first storage area, which may be referred to as a storage tier, for storing a first category of data and a second storage area or tier for storing a second category of data. As encoded data streams are received at the storage management system, the system associates one or more data streams with the first storage area and associates one or more data streams with the second storage area. The data streams are stored in the associated storage

areas. The storage management system monitors the stored data to determine whether a storage area and/or the storage medium is full or meets some other specified maximum capacity threshold. If so, the storage management system deletes data in excess of the threshold. In an example embodiment, the storage management system deletes data having an age that exceeds one or more specified maximum retention times. If the stored data still exceeds a threshold, data with the oldest age from one or both of the first and second storage tiers may be deleted.

[0006] The storage management system may identify a storage ratio specifying the relative amount of data to be stored in the first and second storage tiers. When necessary to maintain the ratio, the data with the oldest age may be deleted from one or both of the first and second storage tiers such that the specified storage ratio is maintained. In an example embodiment, the first storage tier may be a long term storage tier having a long term maximum retention time, and the second storage tier may be a short term storage tier having a short term maximum retention time that is shorter than the long term maximum retention time.

[0007] The data streams may comprise at least two virtual streams of different resolutions. The storage management system associates the lower resolution virtual stream with the short term storage tier, and the higher resolution virtual stream with the long term storage tier. In an example scenario, the virtual streams may comprise multiple virtual streams with each capturing a different region of interest in a field of view. In such a scenario, the storage management system may associate a first region of interest with the short term storage area, and a second region of interest with a long term storage area. The different regions of interest may comprise different portions of a field of view, in which case, a virtual stream of a central portion of the field of view is associated with the long term storage tier, and a virtual stream of a non-central portion of the field of view is associated with the short term storage tier.

[0008] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description of Illustrative Embodiments. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter. Other features are described below.